Appendix A

U.S. 54 Expressway Traffic Study
Miller and Camden Counties, Missouri

US 54 Expressway Traffic Study
Miller and Camden Counties, Missouri

Traffic Technical Memorandum

Submitted to

Missouri Department of Transportation
Harding ESE

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Chapter I - Introduction

Study Objectives

The purpose of the US 54 Expressway project is to provide an improved north-south transportation system through the Cities of Lake Ozark and Osage Beach, Missouri. This study evaluates alignment alternatives for US 54 from Business Route 54 to south of the intersection of Routes 42 and 54, as shown in **Figure 1**. The project is being considered to provide transportation improvements that will address increasing traffic demands due to development along existing Route 54. In addition, the proposed project will improve the system linkage to other planned sections of the proposed US 54 Expressway, which is currently under design. Overall the system is expected to improve traffic operations and provide improved access throughout Camden and Miller Counties.

The purpose of this Technical Memorandum is to document the evaluation of alternatives. This report includes:

- a documentation of existing traffic conditions;
- results of an Origin & Destination (O&D) study;
- the development of traffic forecasts; and
- alternative analysis

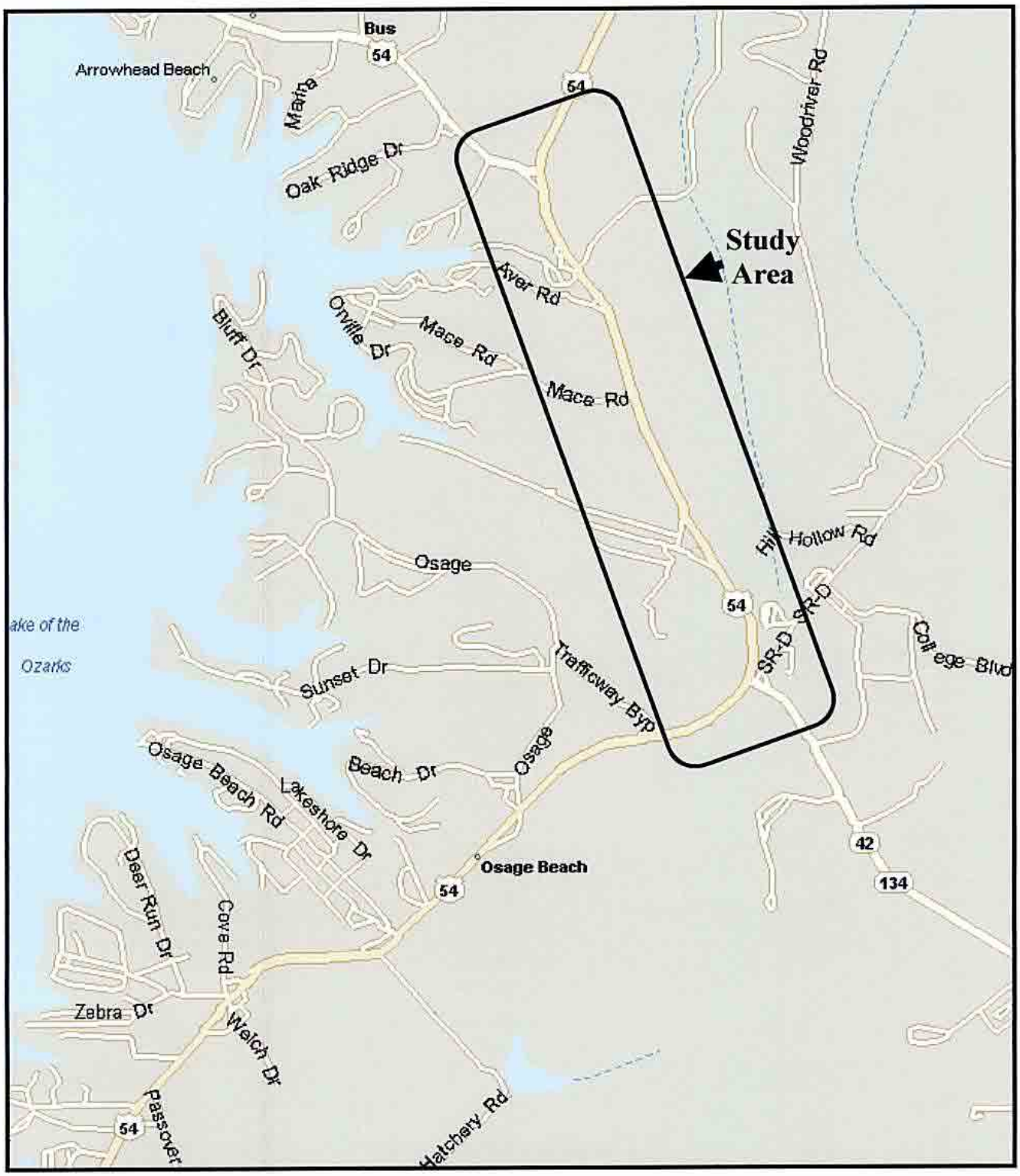
Study Area

Osage Beach and Camdenton are located in Camden County and Lake Ozark is located in Miller County, along the Lake of the Ozarks. The Lake was created due to the construction of Bagnell Dam in 1931. Although built to generate hydroelectric power, the Lake of the Ozarks has long been recognized as a regional recreation facility. Regional growth has been steady since the lake's creation and has increased rapidly in the 1990s. In fact, both Osage Beach and Lake Ozark had very large growth rates in the last decade. Camden County has an estimated 2000 population of 37,051 and is the 212th fastest growing county in the nation out of 3,141 counties. Miller County was 1,070 out of 3,141 counties. **Table 1** below shows the growth rate for each county and key city.

Table 1 - Camden and Miller County Cities and Population

City/County	1990 Population	2000 Population	% Change
Camden County	27,495	37,051	35
Miller County	20,700	23,564	14
Osage Beach City	2,599	3,662	40
Lake Ozark	681	1,489	109
Camdenton	2,561	2,799	9

Figure 1 - Study Area



Although the Osage Beach/Lake Ozark area is a leading vacation spot, it is not served directly by any interstate freeways. Access to the area is predominately provided by US 54, a subregional US route running from I-72 in Illinois, east of Hannibal, through Mexico, Jefferson City, the Lake area, and Nevada, Missouri, terminating at US 77/I-35 east of Wichita, Kansas. US 54's cross-section varies from two lanes to a four-lane expressway with some interchanges through Jefferson City to Business 54 in Lake Ozark. It continues as a five-lane arterial through the lake area, reverting to a short two-lane section before becoming four lanes again south of Route KK to Camdenton, Missouri. It continues as a two-lane roadway to Kansas.

The closest connecting interstate is I-70, running east-west north of Jefferson City. I-44, which runs southwest of the lake area, does not connect directly to US 54 but can be reached via several connector routes (e.g., Route A, Route 5).

Route 42 is a two-lane roadway that runs from US 50 west of Rosebud to US 54. It is rural, but is currently being improved at the intersection of US 54 in accordance with the development of the Pruitt Point project.

Since the study area is a major recreational destination, the major urban centers with proximity to the Osage Beach area were also reviewed. They are listed in **Table 2** and shown in **Figure 2.**

Table 2 – Access to Study Area from Missouri Urban Centers

City	Direction	Distance From Osage Beach (miles)	Route
Kansas City	Northwest	280	I-70 East to US 54 South
St. Louis	Northeast	230	I-70 West to US 54 South
Jefferson City	North	37	US 54 South
Columbia	North	90	I-70 East to US 54 South
Springfield	South	110	I-44 East to US 54 North via Route 5

Figure 2 - Access to Study Area from Missouri Urban Centers

Study Outline

To determine the need for and the appropriate location, alignment and configuration for a new or improved north-south Route 54 expressway, the traffic analysis was divided into several steps. Each individual step is discussed in a separate chapter as follows:

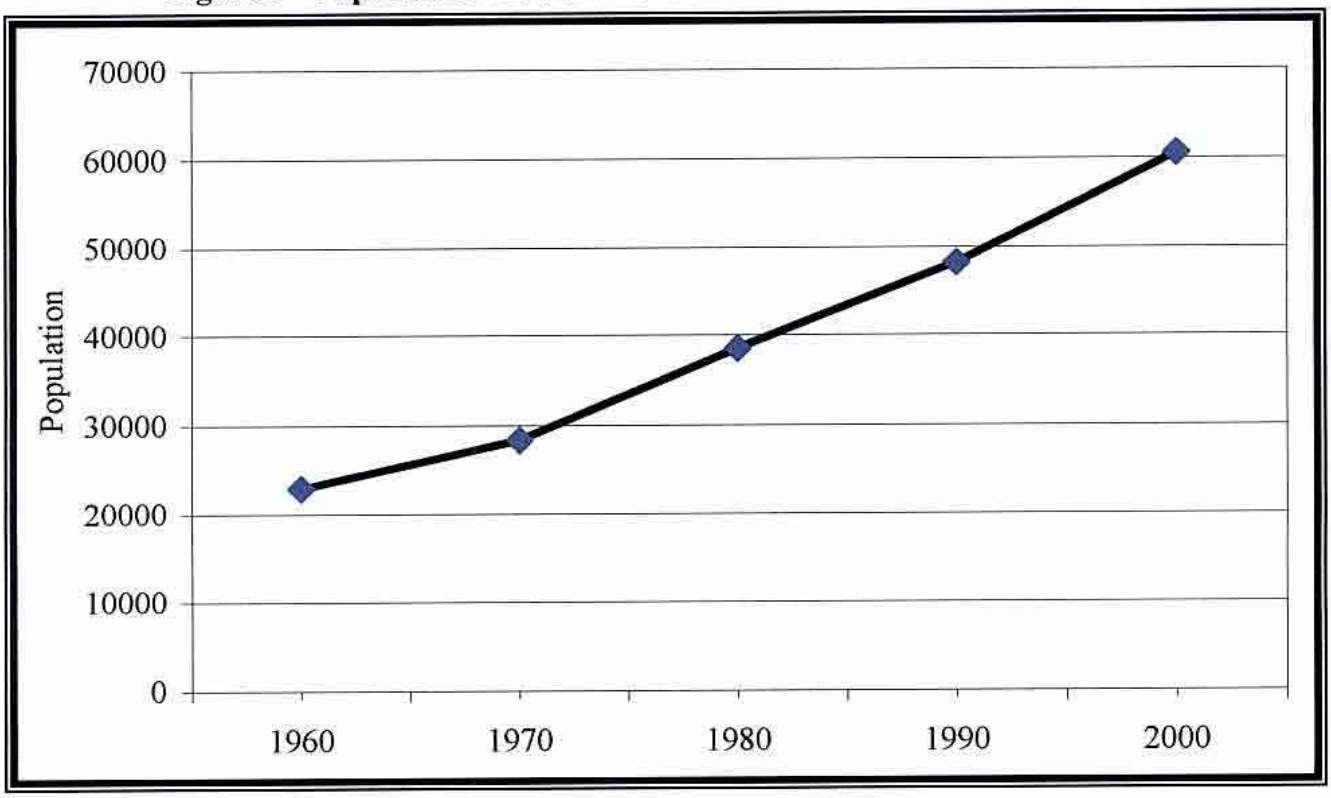
- Chapter II - Existing Conditions - A review of the community's demographic and land use characteristics including employment and population trends, existing traffic conditions and level-of-service analysis for Osage Beach and Lake Ozark's arterial roadways.
- Chapter III - Origin and Destination Study - A review of postcard surveys and roadside interviews conducted to identify the travel patterns and the potential for traffic shifts to the new expressway.
- Chapter IV - Traffic Forecasts – Travel demand forecasting methodology and traffic projections for alternatives based on the origin and destination study and growth trends.
- Chapters V and VI - Evaluation of the Alternatives - Technical operational analysis for each alternative.
- Chapter VII - Conclusions/Recommendations

Chapter II - Existing Conditions

Demographic and Land Use Characteristics

The Camden and Miller County region has grown at a steady pace since the construction of the Bagnell Dam in 1931. In 1960, the bi-county's population was 22,916. By 1970, the population had increased to 28,341, an increase of approximately almost 24%. From 1970 to 1980, the population increased again to 38,549, an increase of just over 36%. Between 1980 and 1990 the region experienced a growth rate of 25%, ending the decade with a population of 48,195. Between 1990 and 2000, the growth rate held steady at 26% with a 2000 regional population of 60,615. This growth trend can be seen in **Figure 3**. Most of this growth has occurred in Camden County. For example, between 1990 and 2000 Camden County grew by 34.8% while Miller County's growth rate was only 13.8%.

Figure 3 - Population Growth Trends in Camden and Miller Counties



Employment

As the region's population increased in the 1990's, the local economy also grew. County business patterns show that employment growth has proceeded steadily, greatly outpacing the state. This growth has been primarily in Camden County, which experienced a growth of 50% in private, non-farm employment between 1990 and 1998. Over 11,896 people were employed in the county in 1998 in private nonfarm jobs. Statewide, the average job growth was only 14.7% during the same period. Much of this growth in Camden County was centered in the retail industry, with almost half a billion dollars in retail sales.

Of the total jobs in Camden County, retail trade is the leading employer with 2,881 jobs in 1999, nearly one quarter of the total non-farm job market. Construction and real estate/finance were also strong industries, so was the manufacturing sector with 1,402 jobs, or approximately 12% of the total non-farm job market.

The total non-farm jobs in Miller County in 1998 were much less than Camden County, with only 6,099 jobs. The manufacturing sector was stronger here, with 1,379 jobs, nearly 23% of the non-farm jobs. This was slightly more than the retail jobs in the county (1,076), which remained strong.

Both counties have a significant health care and social assistance employment base. This is expected to increase as the need increases in the aging population.

The recent slowing of the economy may serve to temper the demand for employment in the near future. However, employment in the area will continue to grow in order to provide for the expected continuing population growth.

Housing

New housing has kept pace with population growth throughout 1990's. This pattern reflects a national trend in which household size continues to diminish and the largest population of "baby boomers" moves to newer and bigger housing. According to the US Census Bureau, there were 44,733 housing units in the two county region in 2000, up from 35,428 housings units in 1990. This is an occupancy rate of only 1.36 people per unit, which is extremely low but also represents the high number of vacation housing units in the area. More importantly, it represents a growth in housing units of 9,305, or about 26%.

Finally, it should be noted that the area surrounding the study corridor is rugged, and most growth has been centered on US 54, or along the lake edge. However, several large-scale developments have occurred or are underway that are spreading out from the traditional development area. Sufficient land to support the 20-year projected growth rates exists within the study area.

Existing Traffic Volumes

Existing traffic conditions were established using current traffic count data collected by the consultant and MoDOT. Most of this data was collected in the form of average daily traffic (ADT) counts. Peak hour turning movement counts were also obtained at the key locations.

Traffic counts were taken on Friday evening (4:00 p.m. to 7.00 p.m.) and Saturday mid-day (11.00 a.m. to 2.00 p.m.), the critical times for roadway capacity in the area. Counts were also taken during August, a peak time for traffic in the study area. **Figures 4**, **5** and **6** show the traffic volumes for weekday, month of the year, and time of the day respectively. Daily traffic figures are shown in **Figure** 7 along with peak hour traffic volumes at key intersections within the Cities of Osage Beach and Lake Ozark study area.

Figure 4 - US 54 (South of Route 42) 2000 Average Daily Traffic Volumes by Weekday

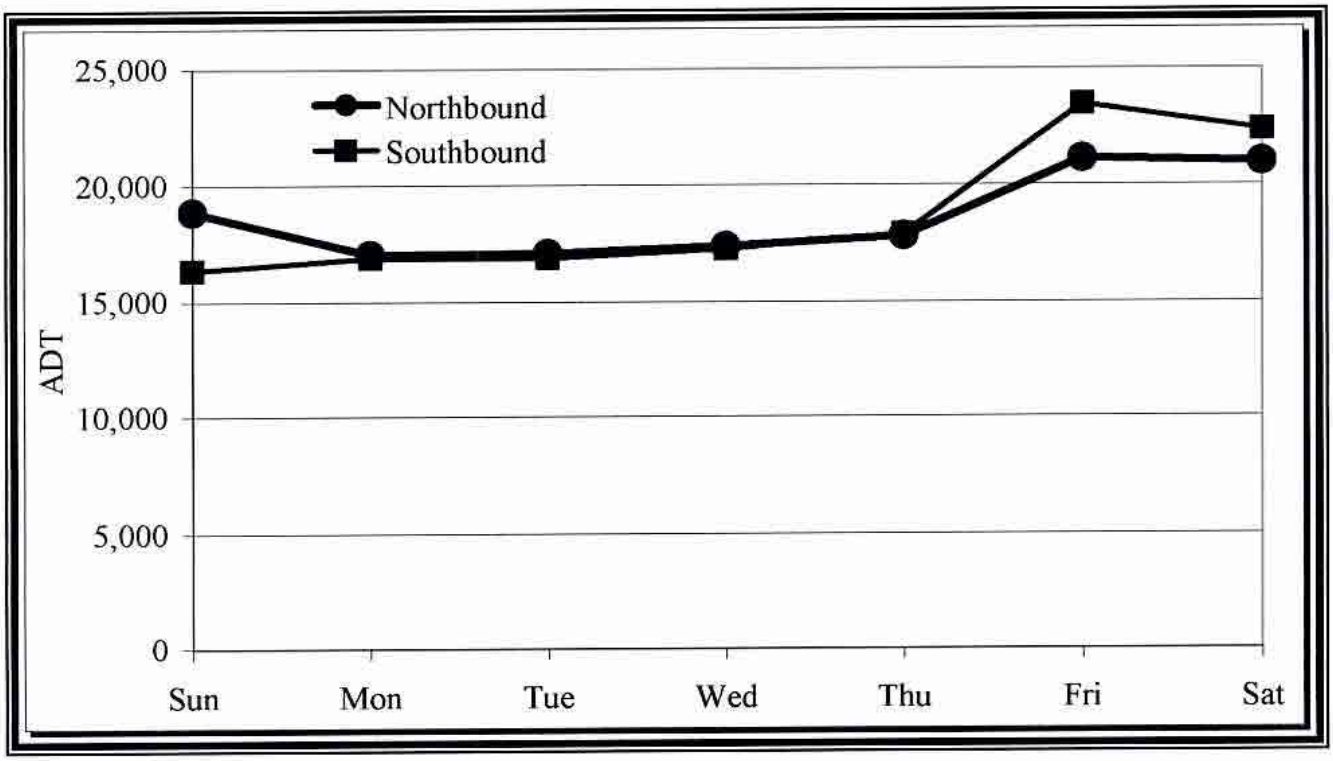
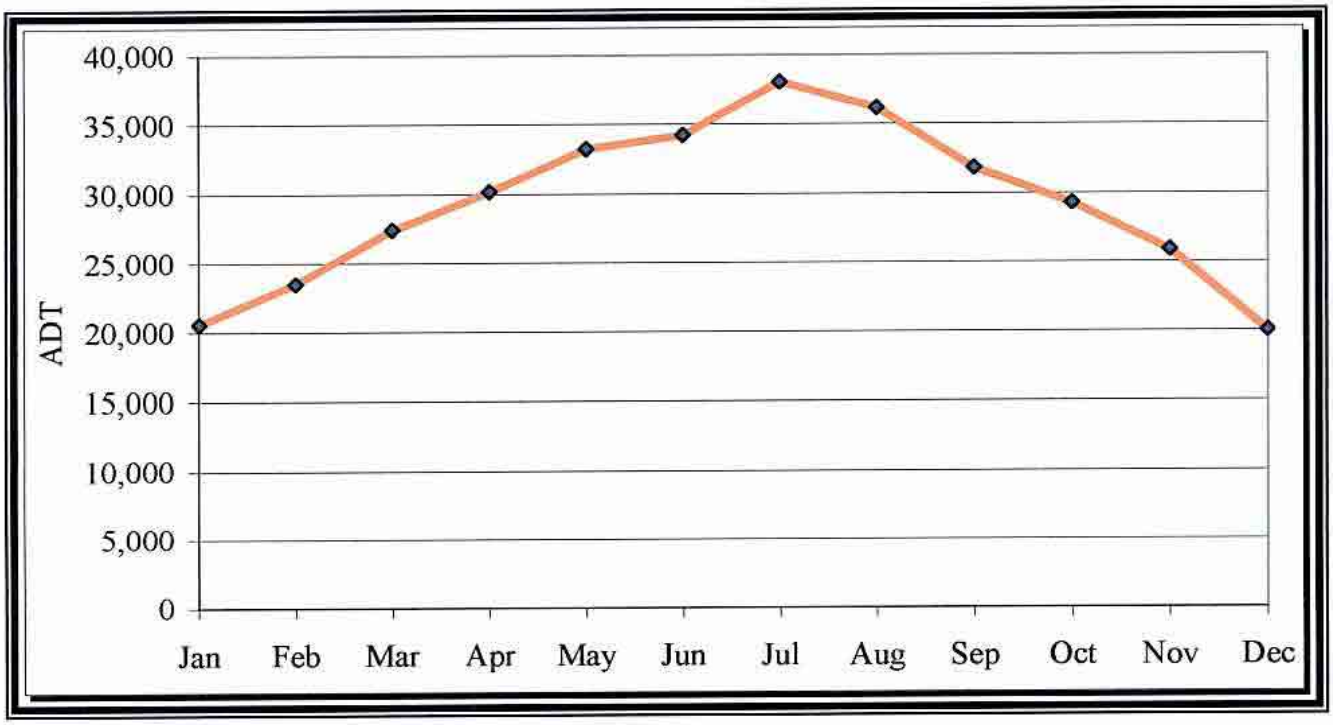
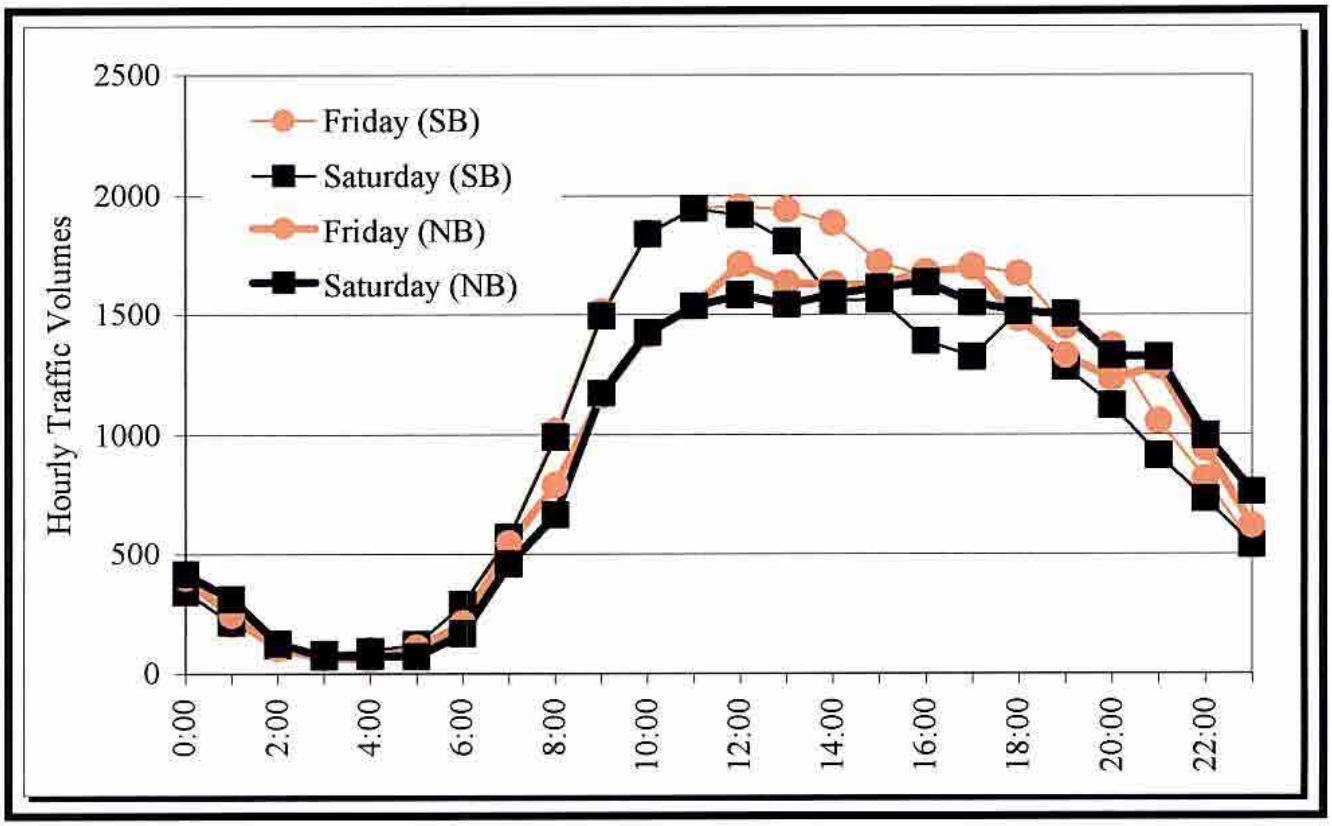


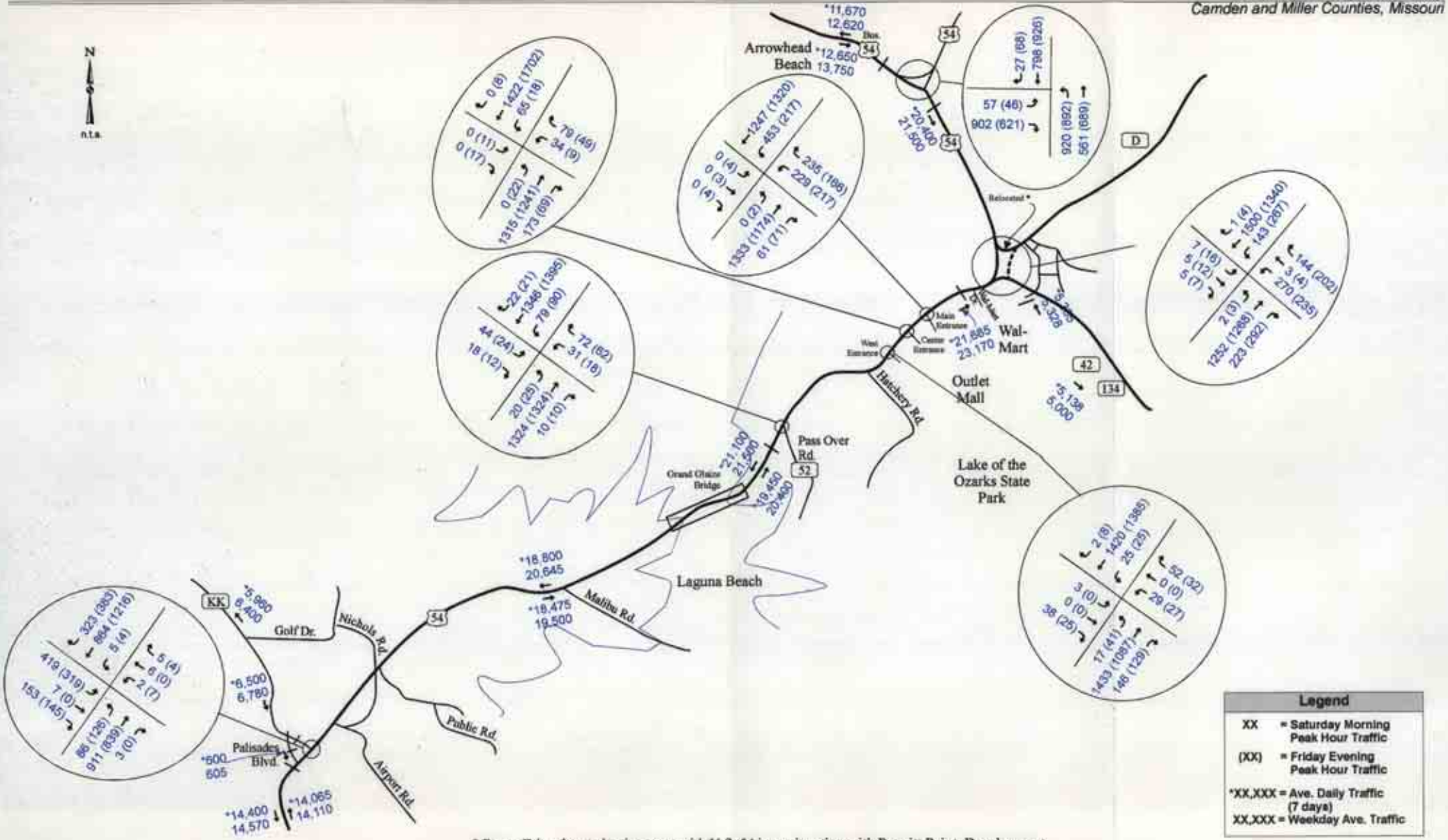
Figure 5 - US 54 (South of Route 42) 2000 Traffic Volumes by Month of the Year*



* *Information provided by Missouri Department of Transportation (MoDOT)*

Figure 6 - US 54 (South of Route 42) 2000 Average Daily Traffic Volumes by Time of day





Legend	
XX	= Saturday Morning Peak Hour Traffic
(XX)	= Friday Evening Peak Hour Traffic
*XX,XXX	= Ave. Daily Traffic (7 days)
XX,XXX	= Weekday Ave. Traffic

* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 7 - Existing Traffic (2001)

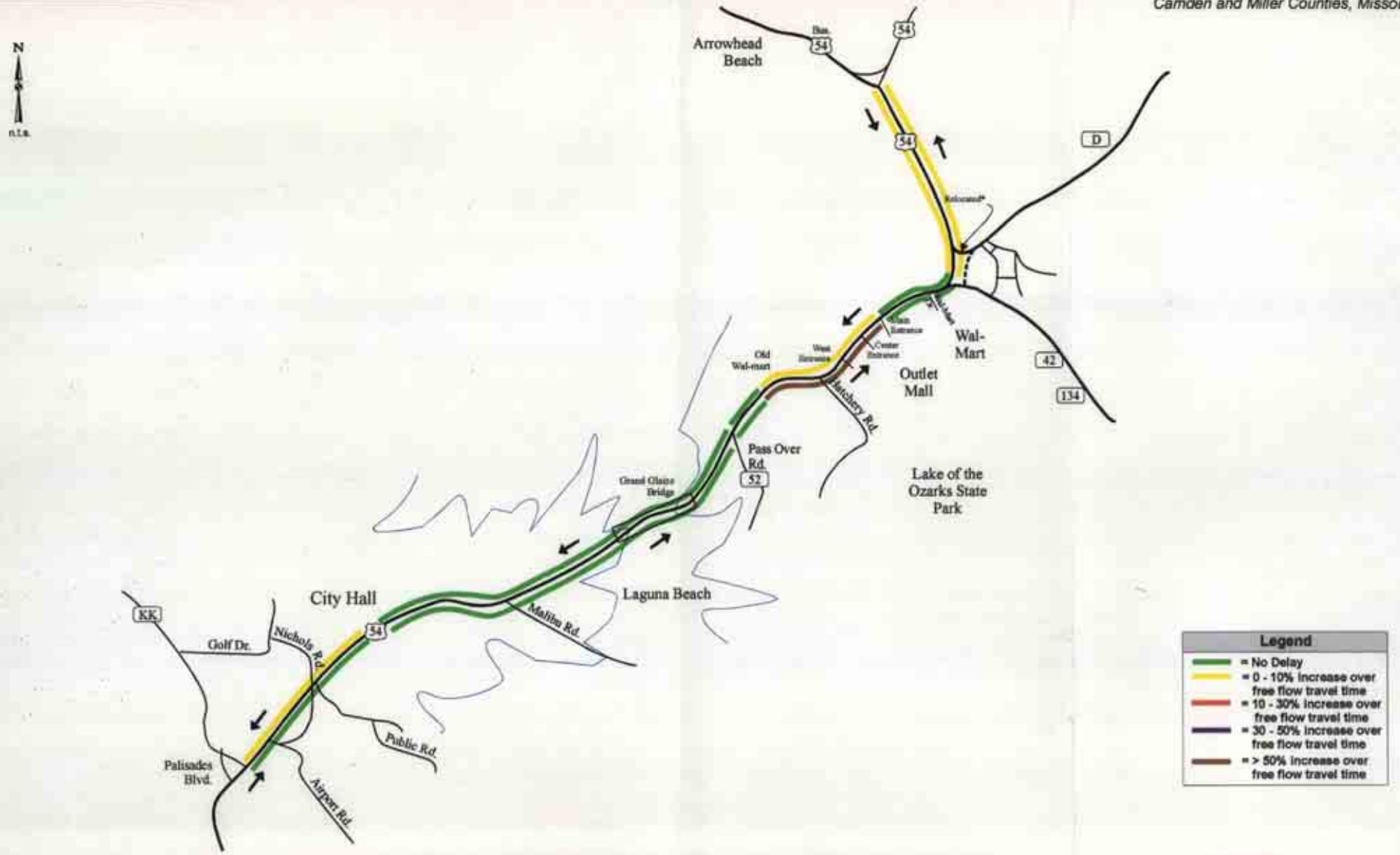
As can be seen in **Figure 5,** US 54 traffic nearly doubles by the peak of the vacation season in late July to nearly 40,000 vehicles per day (vpd), south of Route 42. This amount can reach 45,000 vpd on Fridays in the peak months. By contrast, traffic volumes on US 54 are as low as 20,000 vpd during off-peak months. This amount, however, is still significant for the existing five-lane cross-section of US 54. In fact, 40,000 vpd, in generally terms, could be considered over capacity for this type of facility. However, a review of the hourly counts by time of day shows that the peak hours are relatively flat in relation to off-peak hours. In other words, instead of impacting the peak hours by large spikes in traffic flow, traffic is spread out through the day. This "peak hour spreading" greatly increases the daily capacity of the roadway by not overloading the system during peak times

Travel Times

Travel times on US 54 during peak and off-peak periods were reviewed to determine if excessive travel delays are occurring in any section of US 54 within the study area. Travel times were measured by field travel time runs in both directions during the Friday p.m. and Saturday midday peak hours and during off-peak hours in August 2001 (peak month during the vacation season) to determine the delays experienced by motorists.

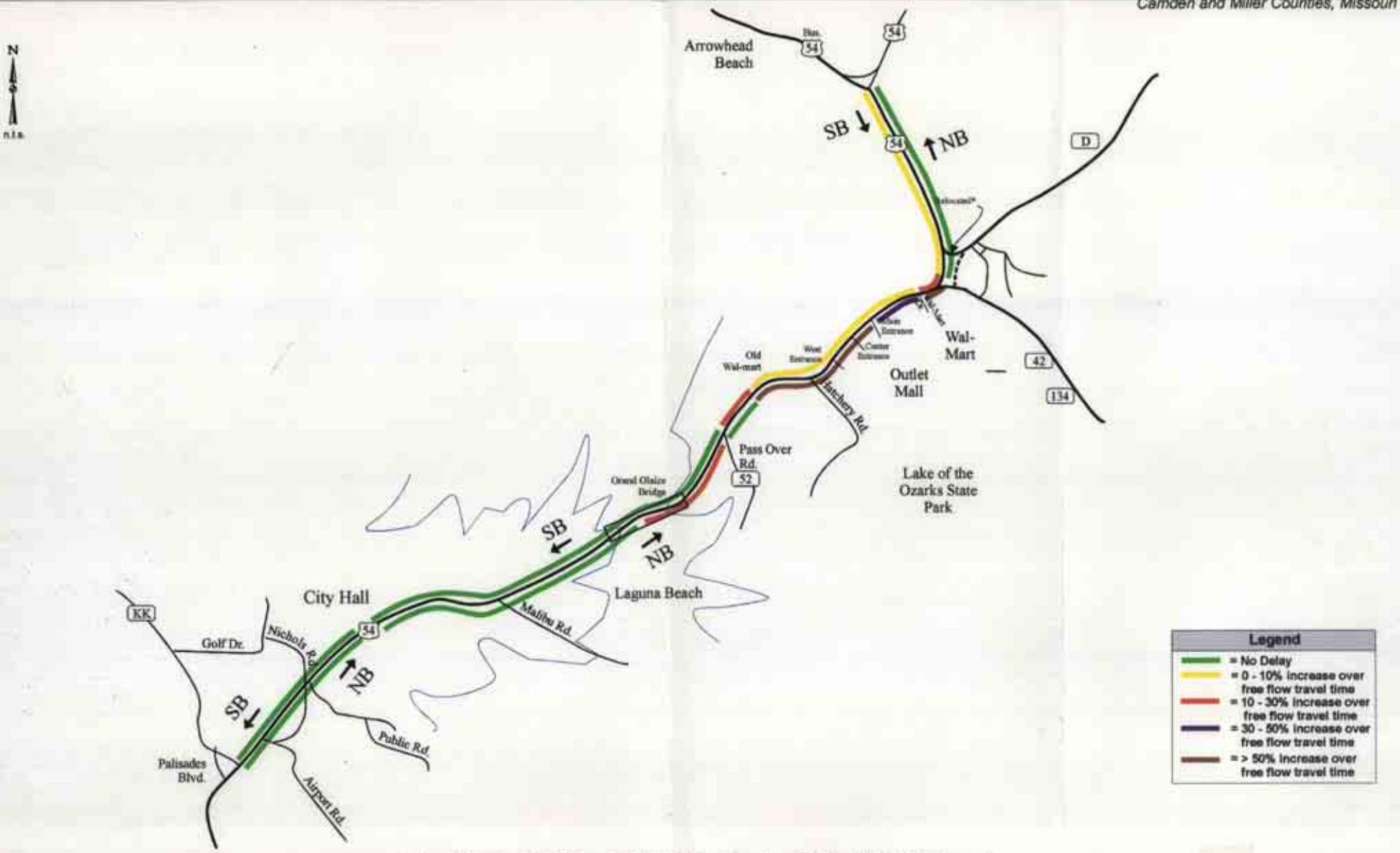
The travel time delay for both the Friday evening and Saturday midday peaks are shown in **Figure 8** and **Figure 9**, respectively. Travel time delay in these figures is defined as the additional travel time experienced during a peak hour to the free flow travel time.

The results of the travel delay measurements show that, for the most part, there is no significant peak hour delay along most sections of US 54 corridor with some notable exceptions. Still, areas between Route 42 to the Grand Glaize Bridge experienced high or very high levels of delay, most notable around the Wal-Mart and the Outlet Mall areas, in which delays were as high as 50%, in the northbound direction on Friday night. This was partly due to construction at the Route 42 intersection, but delay in this general area also occurred during the Saturday midday peak. South of the Grand Glaize Bridge, additional travel delay was almost non-existent during peak times.



* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 8 - 2001 Summer Travel Time Delay (Saturday Mid-day) Northbound & Southbound



* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 9 - 2001 Summer Travel Time Delay (Friday Evening) Northbound & Southbound

Level-of-Service

HCS2000, based upon the methodologies outlined in the "Highway Capacity Manual" published in 2000 by the Transportation Research Board, was used to analyze the Level of Service (LOS) for the intersections on Route 54. This manual, which is used universally by highway and traffic engineers to measure roadway capacity, establishes six levels of traffic service: "Most Desirable" (Level A), to "Fully Loaded" (Level F). General LOS descriptions are given in **Table 3**. Levels of traffic service are measures of traffic flow, which consider such factors as speed and delay time, traffic interruptions, safety, driving comfort, and convenience.

Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is considered acceptable for peak period conditions in urban areas. LOS and vehicular delay are key Measures of Effectiveness (MOE) in the analysis of alternatives.

Table 3 - Level-of-Service Description

LOS	***Description***	***Traffic Loading % of Roadway Capacity***
A	Free flowing traffic	< 50%
B	Low-density stable traffic	51% - 70%
C	Medium density stable traffic flow	71% - 80%
D	High density stable traffic flow	81% - 90%
E	Unstable flow at or near capacity levels	91% - 100%
F	Breakdown of traffic flow	> 100%

The thresholds, which define LOS, are based upon the type of traffic control used at an intersection, i.e. whether it is signalized or unsignalized. For signalized intersections, the average control delay per vehicle is estimated for each movement and aggregated for each approach and for the intersection as a whole. At intersections with partial (side-street) stop control, LOS is defined for each minor movement and is not defined for the intersection as a whole since motorists on the main road are not required to stop.

The HCM 2000 defines LOS in terms of control delay. At signalized intersections, the LOS criteria differ from that at unsignalized intersections primarily because different transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and, consequently, may experience greater delay than an unsignalized intersection. **Table 4** shows the LOS thresholds used in the analysis. It should be noted that analyses of unsignalized intersections produce LOS for individual turning movements (rather than the entire intersection) since through traffic is not required to stop.

Table 4 - HCM 2000 LOS Thresholds

LOS	Control Delay per Vehicle (sec)	
	Traffic Signals	***Unsignalized Intersections***
A	<= 10.0	0-10
B	10.1 to 20.0	>10-15
C	20.1 to 35.0	>15-25
D	35.1 to 55.0	>25-35
E	55.1 to 80.0	>35-50
F	> 80.0	>50

Table 5 shows the LOS for each signalized intersection during the Friday evening and Saturday midday peak hours. The results indicate that most signalized intersections currently operate at an acceptable LOS of level D or better. However, the intersections of US 54 and the Outlet Mall main entrance and US 54 and Route KK both operate at LOS E during peak hours.

Table 5 - Signalized Intersection LOS for 2001 Peak Summer Traffic

Location	Saturday Midday Peak Hour		Friday P.M. Peak Hour	
	LOS	Delay*	LOS	Delay*
US 54/ Rte. 42	C	32.2	C	33.7
US 54/Bus. 54	C	31.8	D	38.1
US 54/ Mall Main Entrance	E	69.8	D	36.1
US 54/ Rte KK	D	49.3	E	75.9

*Control Delay in seconds per vehicle.

Table 6 shows the LOS for each unsignalized intersection during the Friday p.m. and Saturday midday peak hours. For unsignalized, two-way stop-controlled intersections, main line traffic does not stop, so the capacity criterion is based on reserve capacity of the side street, ranging from greater than 400 vehicles reserve capacity for level A to zero vehicles reserve capacity for level F. **Table 6** indicates that the LOS for the unsignalized intersections at the Mall are "F" during peak hours with significant amounts of delay. Observation of these entrances showed many motorists opted to make right turns and then lefts, effectively making u-turns. This behavior causes additional turning movements, further degrading capacity.

Table 6 - Unsignalized Intersection LOS for 2001 Summer Peak Traffic

Location	Saturday Midday Peak Hour		Friday P.M. Peak Hour	
	LOS	Delay*	LOS	Delay*
US 54 / Mall's Center Entrance				
Westbound Left	F	696	F	254
Eastbound Left	F	NA	F	249
US 54 / Mall's West Entrance				
Westbound Left	F	747	F	292
US 54 / Passover Road				
Eastbound Left-Right	F	NA	F	687
Westbound Left-Right	F	495	F	233

*Control Delay in seconds per vehicle.
NA HCS Level of Service incalculable for this movement

Other Studies and Reports

Two major projects are underway in the study area. One is Prewitt Point, a predominately retail development including a Lowe's and other retail uses, located in the northeast corner of US 54 and Route 42. The other is the Home Depot development to be located south of Route 42 adjacent to the expressway corridor. Each study is described further below:

Traffic Impact Study, Prewitt Point - Shafer, Kline & Warren, Inc completed a study of the Prewitt Point development, located in the northeast corner of the intersection of US 54 and Route 42. That commercial development will consist of approximately 575,000 square feet of retail space with a Lowe's, a movie theater complex, a grocery store and additional retail space. It will also include an Expo Center and a residential component as well. SKW projected a total of 3,780 peak hour trips (Saturday midday). Several roadway improvements recommended in association with the development which are currently under construction, include the following:

- Northbound right-turn lane along US 54 in front of the development
- Additional right and left turn lanes at the intersection of US 54 and Route 42
- Widening of Route 42 between US 54 and College Boulevard
- Installation of traffic signals at Route 42 and the new College Boulevard.

Traffic Impact Study, Home Depot - The development would consist of a new Home Depot, as well as an additional 19,460 square feet of retail shops. A review of this report showed that the proposed Home Depot development would add 545 new trips to US 54 during a typical Saturday midday peak hour in the summer. Identified improvements include the following:

- Signalization of the proposed intersection of Home Depot with US 54
- Dedicated southbound left-turn lane of 200 feet
- Northbound right-turn lane of 150 feet
- A dedicated northbound right-turn lane on US 54 at relocated Route D by year 2010.

The origin and destination study conducted for this project, traffic forecasts, and analysis of the alternatives are presented in the subsequent chapters.

Chapter III - Origin and Destination Survey

The purpose of this chapter is to describe the methodology and the results of the origin and destination study performed for Osage Beach and the Missouri Department of Transportation (MoDOT) in August of 2001. The origin and destination study was conducted to identify the travel patterns within the Osage Beach and Lake Ozark areas and was used in the generation of traffic projections for the alternative alignments of US 54 Expressway.

Specific goals outlined included the following:

- Determine the number of trips that have either an origin or destination within the study area
- Determine the reason for the trips
- Help determine potential traffic shifts for the expressway project

A complete description of the survey methodology is discussed below.

Survey Methodology

The O&D study, coupled with traffic counts, enabled the study team to develop a detailed and accurate baseline of traffic volume, purpose, and origin-destination of individual trips. To gather the O&D information, postcard surveys were distributed to motorists using the current south leg of the intersection of US 54 and Route 42 in Osage Beach, Missouri. Postcard surveys were performed in lieu of roadside interviews at this location in order to minimize traffic disruptions at the survey location. The survey was conducted in two (of four possible) directions of travel, accommodating southbound and westbound movements. Information concerning trips in the opposite direction was also collected as part of the survey. Press releases were sent to area media outlets to inform citizens of the upcoming survey, so that they would exercise caution in the survey zone and participate in the planning process. As a part of the survey, motorists were asked which zone their trip originated and/or ended. Also, the purpose of each trip was recorded.

All survey procedures, including traffic control and planning, were pre-approved by MoDOT. Traffic control plans were designed in accordance with the "Manual on Uniform Traffic Control Devices for Streets and Highways." Staffing at the survey station included flaggers and varying number of personnel to distribute postcards, depending on the peak volumes at each location. All personnel were equipped with high-visibility orange hats and vests, which were worn at all times. Cooperation from those motorists who participated in the surveys was excellent.

In total, 3,000 postcards were distributed. Postcards were handed out from 4:00 p.m. to 6:00 p.m. on Friday evening and from 11.00 a.m. to 1.00 p.m. on Saturday midday. Traffic was very heavy in all directions, partly due to overcast weather (which tends to pull people off the lake, we were informed). Although some measure of experienced delay occurs naturally, additional delay associated with the survey was minor and traffic flowed at all times.

In addition to the postcard survey, roadside interviews were conducted at Wal-Mart and the Outlet Mall. Permission was obtained from Wal-Mart to interview on-site. The outlet mall did

not grant permission due to their negotiations with MoDOT regarding right-of-way for the project. Therefore, interviews for the Outlet Mall were collected at the exit lane at the signalized mall entrance on MoDOT right-of-way. The goal of 400 total interviews was obtained for the sites.

Analysis Zones

After careful consideration, the study area was divided into five origin zones and seven destination zones. These zones are shown in **Table 7**.

Table 7 – OD Study Origin and Destination Zones

Origin Zone	Destination Zone
Kansas City	Wal-Mart or other adjacent uses
St. Louis	Outlet Mall or other adjacent uses
Columbia/Jefferson City	Between Grand Glaize Bridge and Outlet Mall
Local (in the Lake of Ozarks area)	Between Route KK and Grand Glaize Bridge
Other Missouri Location	Route KK
Out of State	South of Route KK

Zones were established to conform to logical start/stop points and to help determine which expressway alignments and segments would best serve the area. Therefore, the zones varied in size considerably and their borders were loosely defined. In general, origins centered on cities and destinations centered on major roadways.

Survey Forms

Information was gathered in addition to the origin and destination of the motorist. Other information that was solicited included the following:

- Whether they would make and/or were making a return trip through Osage Beach
- Trip purpose (work, shopping, home, school, social/recreation, pick-up/delivery, business, doctor/hospital, multiple, other)
- Whether they made stops on the way to their primary destination
- Any comments they may have concerning traffic flow around and about the study area

A copy of the survey is shown in the Appendix. Survey results are discussed in subsequent sections.

Survey Return Rate

Of the 3,000 postcard surveys distributed, 730 cards were returned for a return rate of 24%. Of the cards that were returned, five were discarded as inaccurate or incomplete, or 0.2% of returns.

Analysis of Existing Vehicular Patterns

Trip information from the surveys was categorized by vehicle classification, trip frequency and trip purposes. Trip origin and destination information was categorized to include the following:

- External-to-External Traffic (through traffic), or trips that had neither their origins or destinations inside the Cities of Osage Beach and Lake Ozark;
- External-to-Internal Traffic, encompassing trips that had either, but not both, their origin or destination outside the Cities of Osage Beach and Lake Ozark; or
- Internal-to-Internal Traffic, encompassing trips that had both their origin and destination inside the Cities of Osage Beach and Lake Ozark.

The results indicated that most trips, 56.3%, come from the local (Ozarks) area. Destinations to Wal-Mart and adjacent areas on Route 54 totaled 22.6%; Outlet mall and adjacent areas on Route 54 totaled 19.9% while 19.5% traveled beyond south of Route KK. A brief summary of the postcard survey results is given in the **Table 8** and **Figures 10, 11 and 12**. In addition, **Figure 13** also shows the inbound and outbound destinations graphically.

Table 8 - Summary of postcard survey results

DESCRIPTION	TOTAL	BASE	PERCENTAGE
Total number of cards received	726	3000	24%
Number of rejected cards	6	726	1%
Total comments	105	720	15%
Number of positive [Y] comments	76	105	72%
Number of negative [N] comments	23	105	22%
Number of neutral comments	6	105	6%

[Y] Number of people who were in favor of the improvements and the bypass for Route 54
[N] Number of people who were against the idea of the new bypass

As can been seen from **Figure 13**, most traffic arrives in the corridor from US 54 (almost 60% of total). A fair amount of traffic, however, also arrives via Business 54 and MO Route 42. Most trips, 78.9%, were external-to-internal trips, with only 21.1% of trips continuing on beyond Route KK. Nearly 50% of the traffic during the peak hours south of Route 42, which is the busiest section of US 54, was associated with Wal-Mart and the Outlet Mall. A summary of the interview results is given in the Appendix.

Figure 10 shows the trip origin. As can be seen from the **Figure 10**, local trips make up 56.3% of all trips; the next highest trip is from Columbia/Jefferson City. **Figure 11** shows the destinations of the trips.

Figure 10 - 2001 Summer Peak Hour Trip Origin

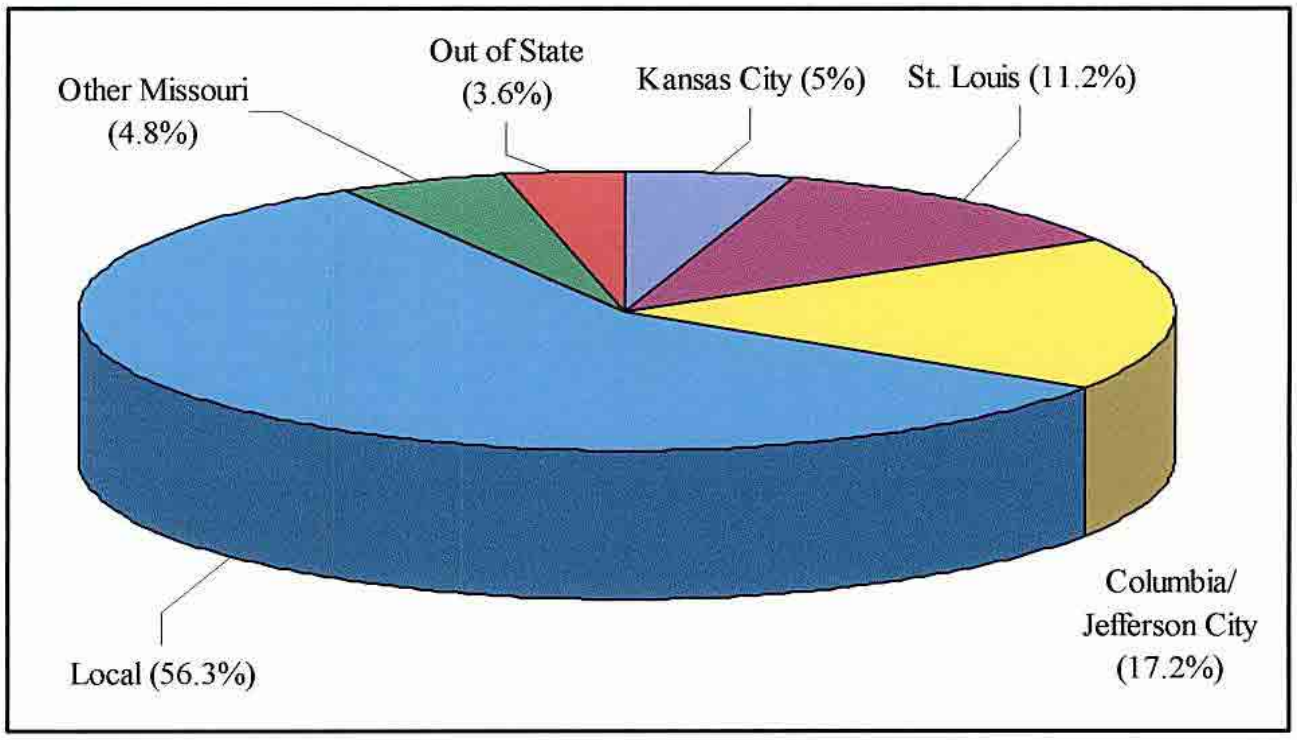
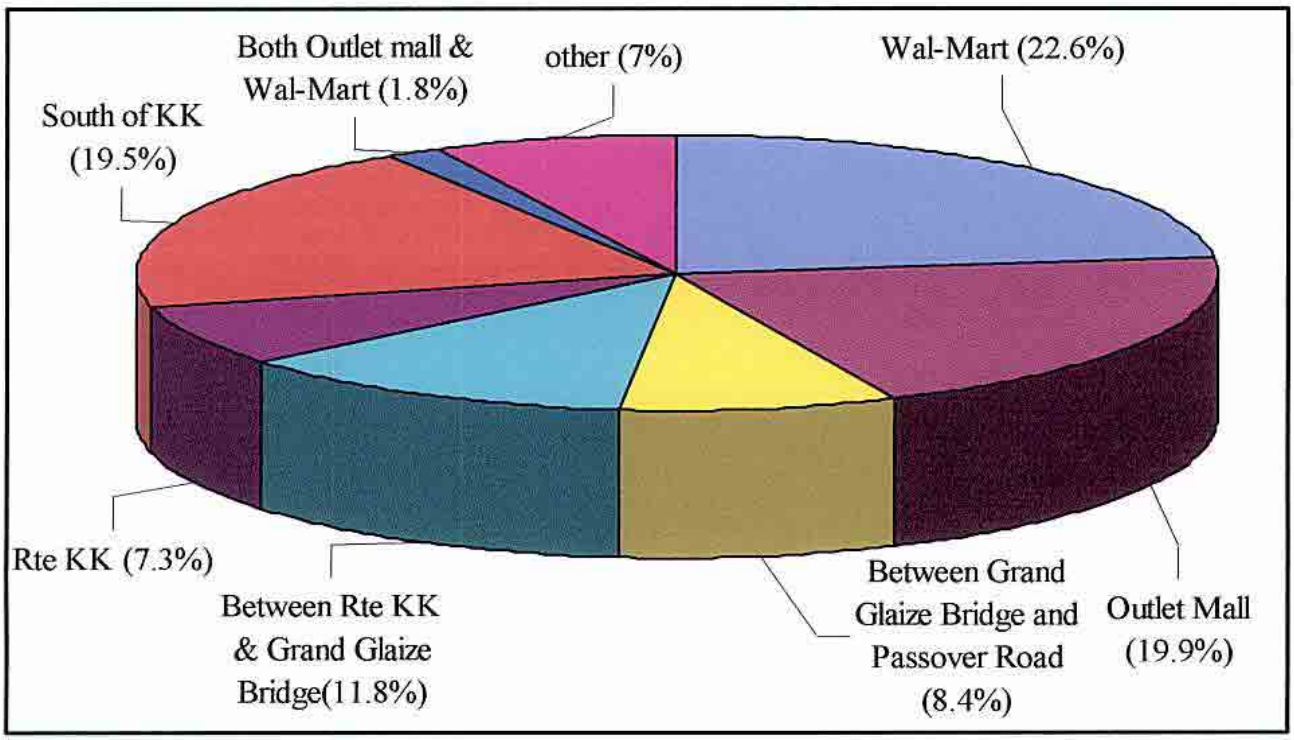


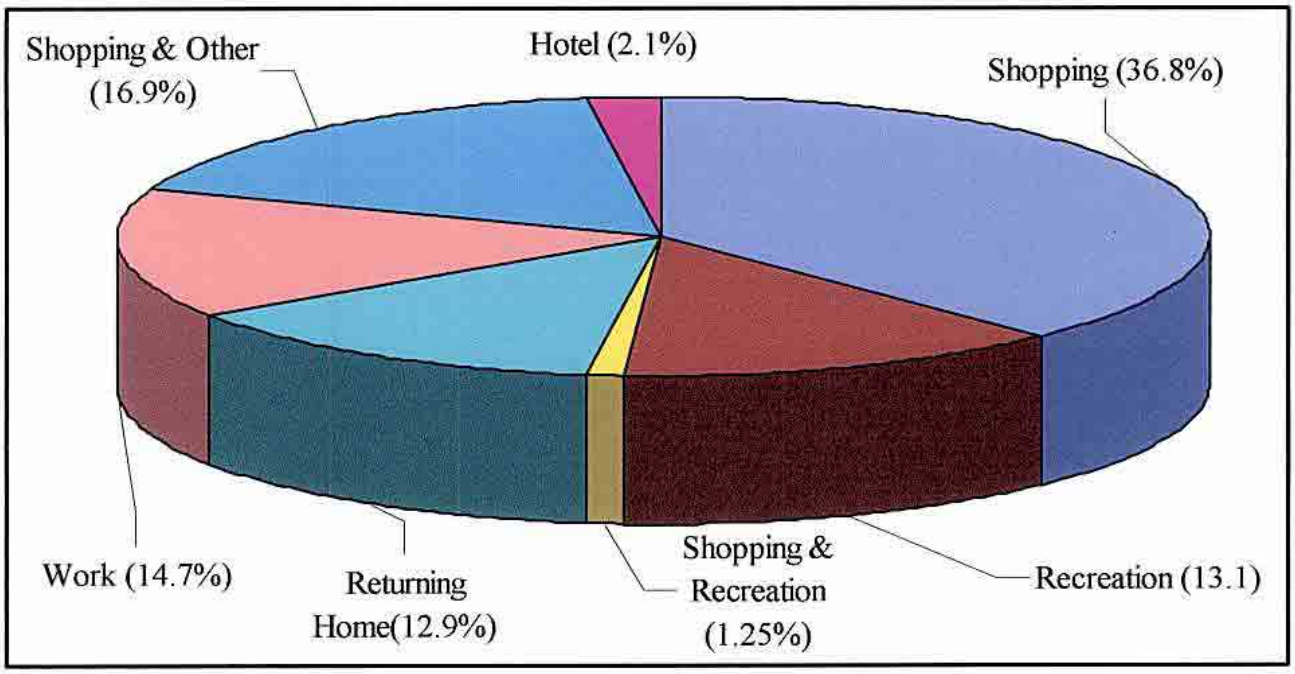
Figure 11 – 2001 Summer Peak Hour Trip Destinations

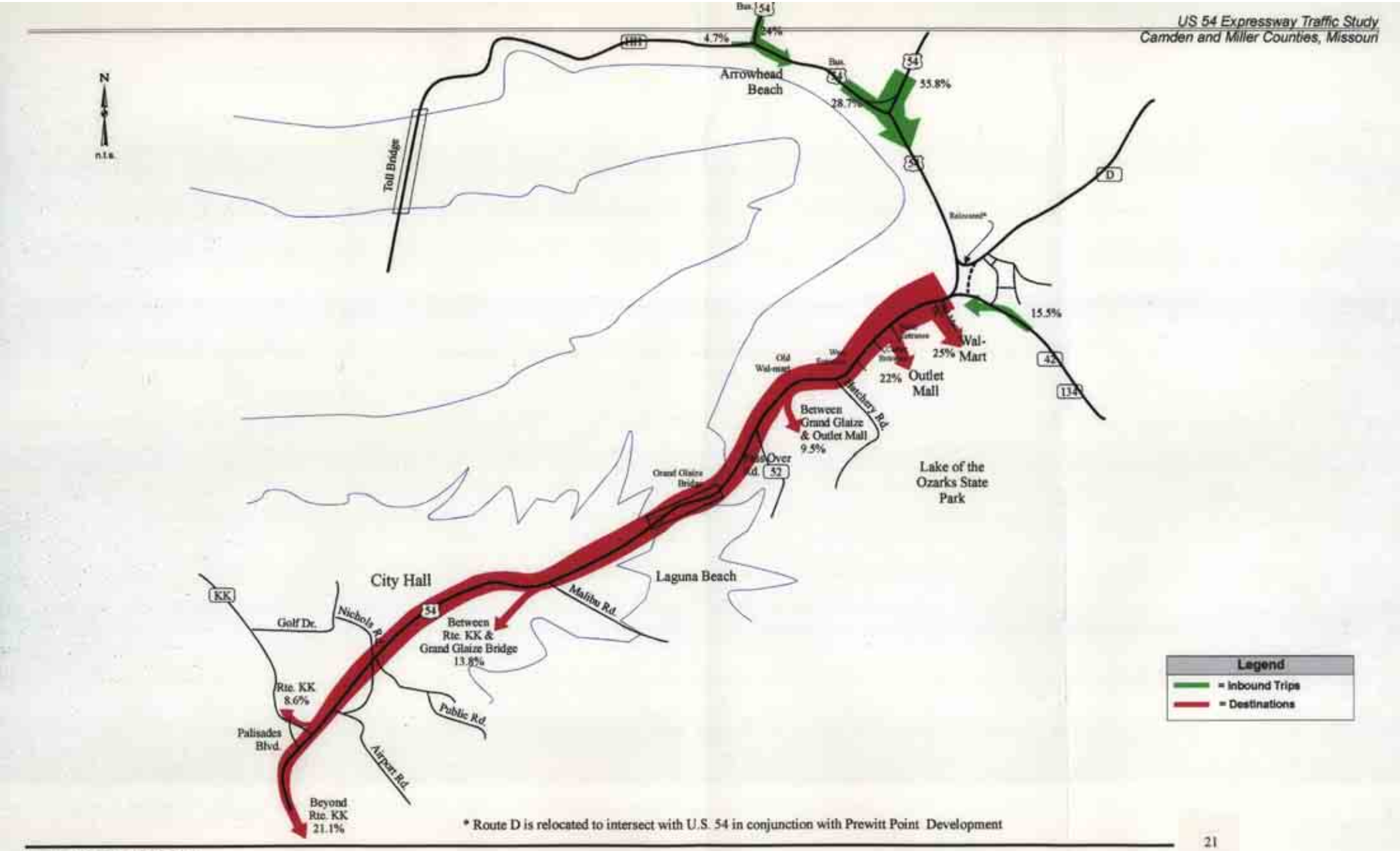


Most of the trip destinations were shopping, with 22.6% going to Wal-Mart and adjacent areas and 19.9% going to Outlet mall and adjacent areas. The next highest of 19.5% are through trips. Besides the primary trip purpose, the survey asked whether or not an additional stop at Osage Beach would be made as part of the current trip. 61.8% responded that they would make a stop.

The results also show that 36.8% of the total trips are shopping trips, 13.1% of trips are recreational trips, 14.7% trips are work trips, and 12.9% were retuning back home.

Figure 12 – Summer 2001 Peak Hour Trip Purpose





* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 13 - Major O&D Map

Conclusions

The O&D study, combined with other existing traffic information, provided a clear snapshot of the current traffic characteristics in the study area and on US 54 in general. After careful analysis, key points can be made including the following:

- The postcard survey response rate was 24%.
- 14% of the responses included the comments about the potential bypass and other improvements. Of these, 72.4% of the comments were in favor of either the improvements to Route 54, Grand Glaize Bridge, Route 42 or a bypass to Route 54. 21.9% of the comments were against the idea of a new bypass.
- Approximately 56.3% of the peak hour trips are local.
- Only 3.6% of the trips constituted out of state trips.
- Approximately 45% of the peak hour trips destinations were Wal-Mart and Outlet Mall, and 19.5% of the trips were through trips.

Future conditions based on area land use and growth, traffic forecasts, and alternative analysis are discussed in Chapters 4-6.

Chapter IV – Traffic Forecasts

The origin and destination data discussed in Chapter 3 was used to determine the potential for traffic shifting onto a new US 54 Expressway. These projections were then expanded to the design year (2021) volumes based on historic traffic and population growth trends in the area.

Population Trends

Based on the stability of population growth over a very long time period, trend line analysis of population history is a valid methodology for projecting growth for future years. However, conditions unique to a particular region should be taken into account. For example, it was noted that both counties in the study area have a higher percentage of persons over age 65 than the statewide average of 13.5% (19% of Camden County's population is over 65, while 15.3% of Miller County's population is in that category). As a result, cohort survival analysis (mortality rates) would tend to lower the projections from pure trend line forecasts.

Another phenomenon associated with regional growth is the amount of retirees moving to the area associated with the "baby boomers" generation. This rate should increase throughout the next 10 years, then taper off reflecting the smaller cohort groups that follow.

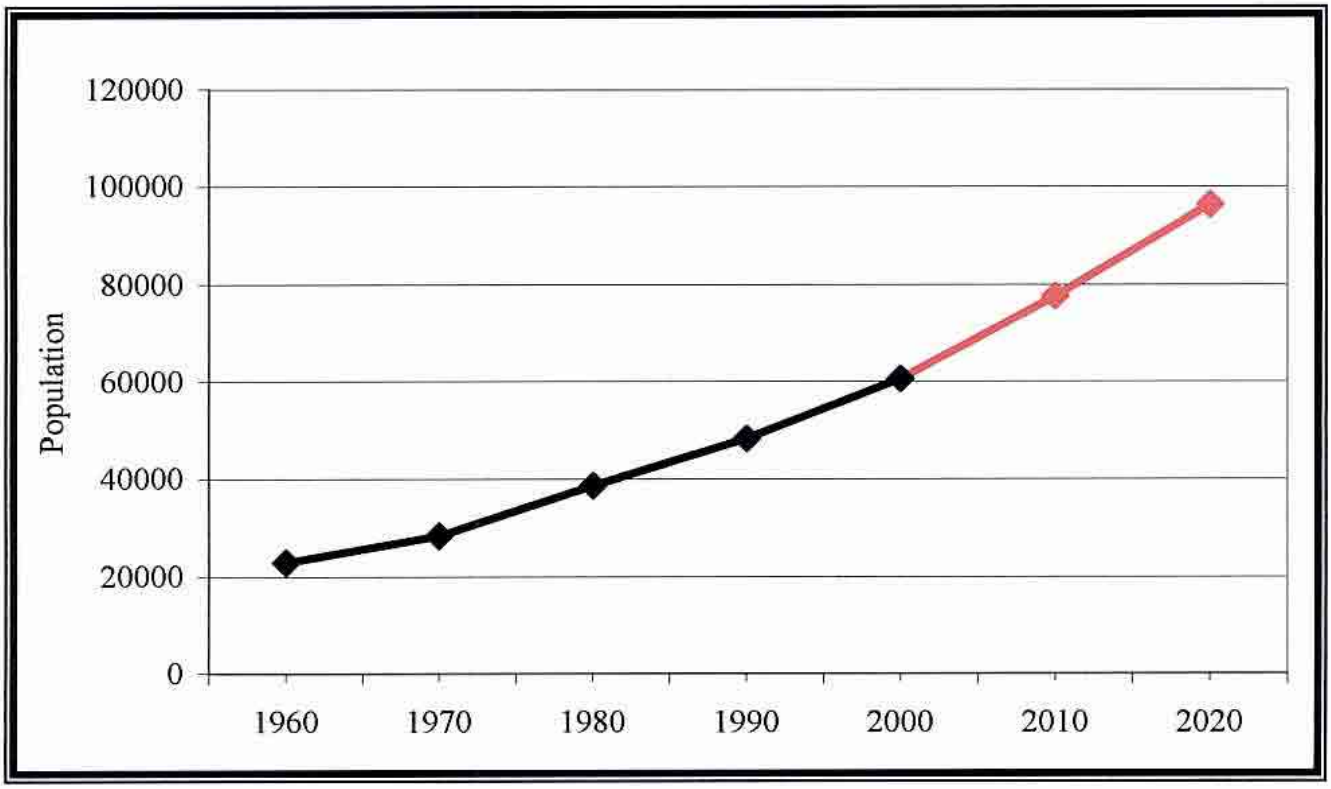
Economic conditions may remain soft throughout the first portion of the next decade, but much of the projected growth in population will come from cohorts less susceptible to market conditions. Finally, it should be noted that population projections do no take into account seasonal residents who are in the area during the summer months only. These groups are reflected in employment projections or in commerce activities (shopping, boating, etc.).

Table 9 and **Figure 14** show the projected population growth reflecting a growth rate throughout the next decade slightly higher that the previous decade, then tapering off to slightly less than previous rates. Resulting in an overall growth rate for the region of 59% (approximately 2.3.% a year) over 20 years.

Table 9 - Camden and Miller County Cities and Population

City/County	2000 Population	2010 Projected Population	% Change 2000-2010	2020 Projected Population	% Change 2010-2020
Camden County	37,051	50,389	36%	65,506	30%
Miller County	23,564	27,334	16%	30,887	13%
TOTAL	60,615	77,724	28%	96,393	24%

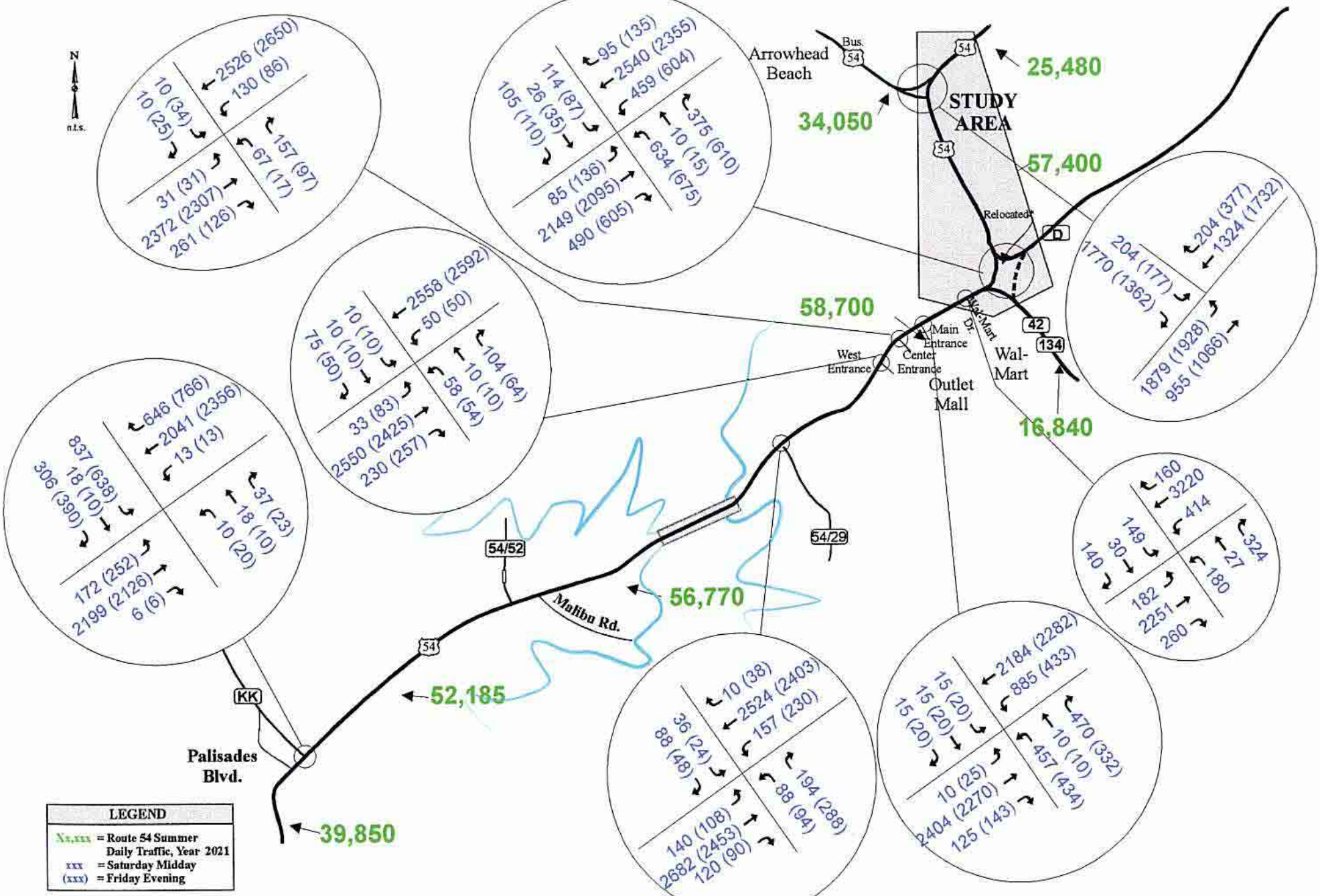
Figure 14 - Forecasted Population Growth in Camden and Miller Counties



Traffic Volume Projections for the No Build Scenario

The No Build scenario includes the projected volumes for the area without either the new expressway or any major system improvements. As can be seen from **Figure 14**, Camden and Miller Counties have experienced a steady growth. This growth is projected to continue over the next 20 years. Based on the historical population growth rate and the traffic counts, a growth rate of approximately 1.5% was applied over a 20-year period considering the capacity constraints on the existing US 54. This rate of growth resulted in approximately 35% increase in the total traffic volumes from the existing volumes. Again, this growth rate is limited by capacity constraints in the existing roadway network. Although lower than the historical growth rate, this growth rate represents a conservative estimate of future growth.

The projected average daily traffic volumes (ADT) and the peak hour turning movement volumes for the no build scenario are shown in **Figure 15.**



* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 15: US 54 No Build Scenario
Summer Peak Traffic Forecasts and Peak Turning Movement Volumes, Year 2021

Traffic Volume Projections for the Build Scenario

The build scenario includes the new US 54 expressway as illustrated in **Figure 16**.

Potential for Existing Trips to Utilize the Expressway Based on O&D Data - Based on existing traffic patterns and the information from the O&D survey, it is possible to estimate how many existing trips might potentially be attracted to the new expressway facility if a new facility were built. These estimates assume that the existing facilities would remain in place. **Table 10** summarizes the amount of trips that may shift to a new expressway. **Figure 17** shows the potential number of trips that will be diverted to the new expressway.

Table 10 - Potential of Expressway to Attract Existing Trips (By Segment)

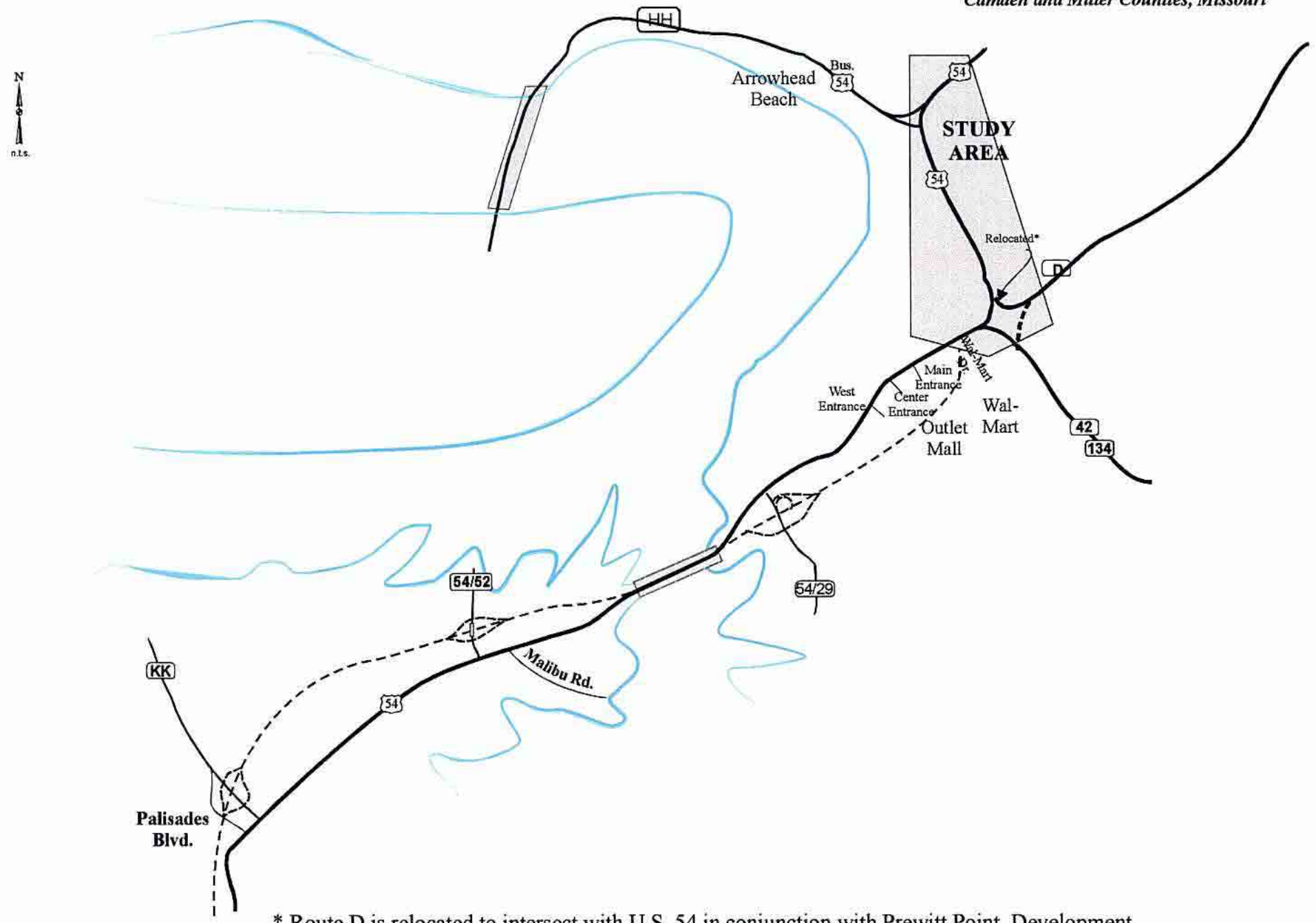
Segment	Existing US 54	New Expressway	Existing US 54 with new expressway
1	41,000	18,810	22,190
2	45,000	15,750	29,250
3	40,550	32,555	12,440
4	37,275	20,720	16,655
5	28,465	15,820	12,645

As can be seen from **Table 10**, approximately 19,000 trips of the 40,000 average summer daily trips on US 54 south of Route 42 could benefit from a new expressway. These are predominately through trips on US 54, as well as trips that can use individual segments of the expressway before exiting to reach their destination.

It should be reiterated that of the total trips, over 60% indicated they stop in the study area primarily to shop. Only a portion of these pass-by trips would be attracted to the by-pass. Some might be attracted to various segments of the expressway, if provided convenient access. To attract additional trips, enhanced access would be needed at key areas, such as at Wal-Mart and/or the Outlet Mall.

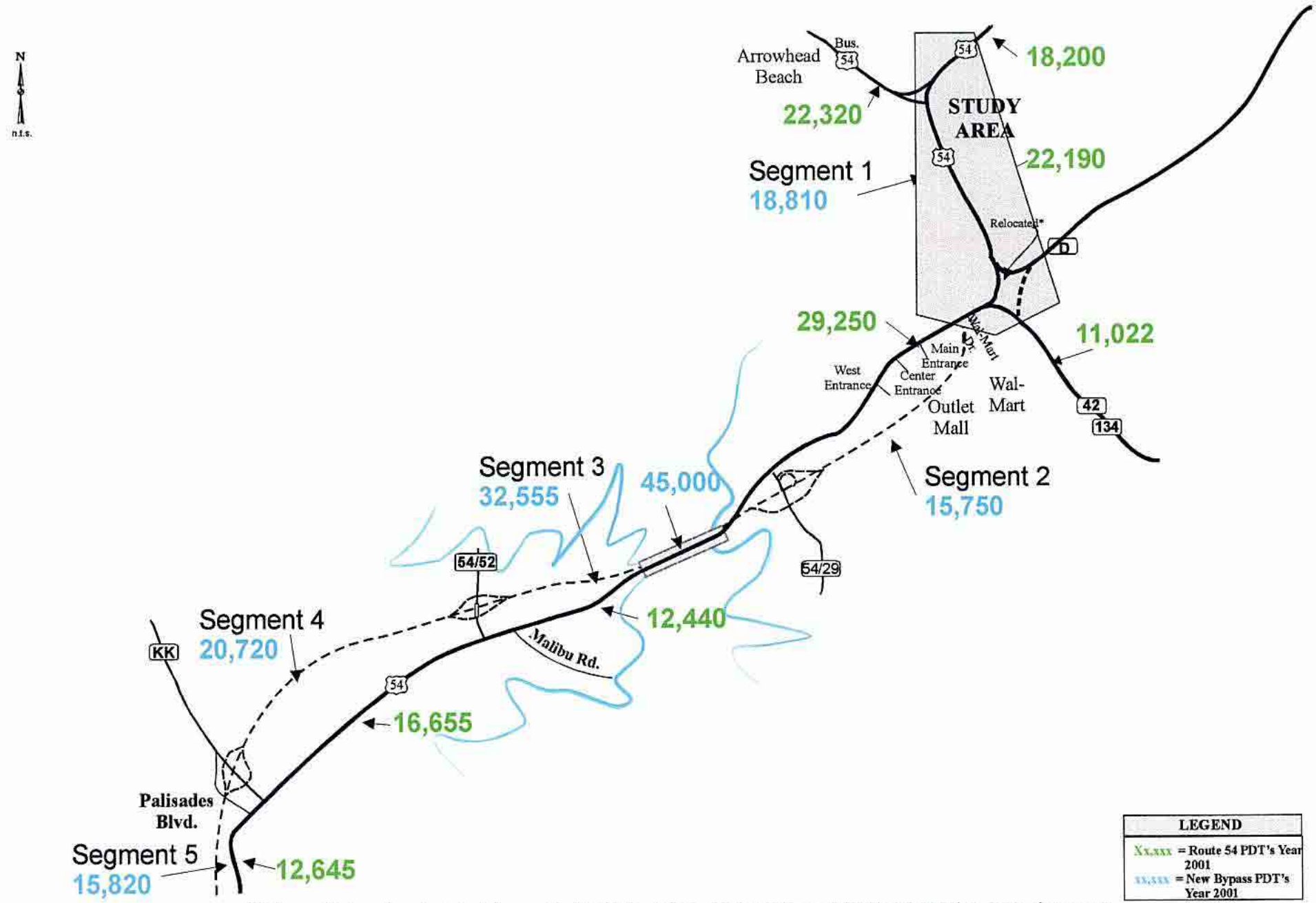
Traffic Projections - Based on the historical growth trends and future developments in the Osage Beach and Lake Ozark areas, an annual growth rate of approximately 2% per year was applied. Unlike the No Build scenario, the traffic volumes in the Build scenario are unconstrained, as the capacity of the Route 54 corridor (including the Expressway and Business Route 54) increases with the new expressway. Applied over a 20-year period, this rate of growth resulted in approximately 59% increase in total traffic volumes, in line with population growth projections

The traffic projections along with the peak hour tuning movements for the build scenario are shown in **Figure 18** and the traffic growth trends are shown in **Figure 19**.



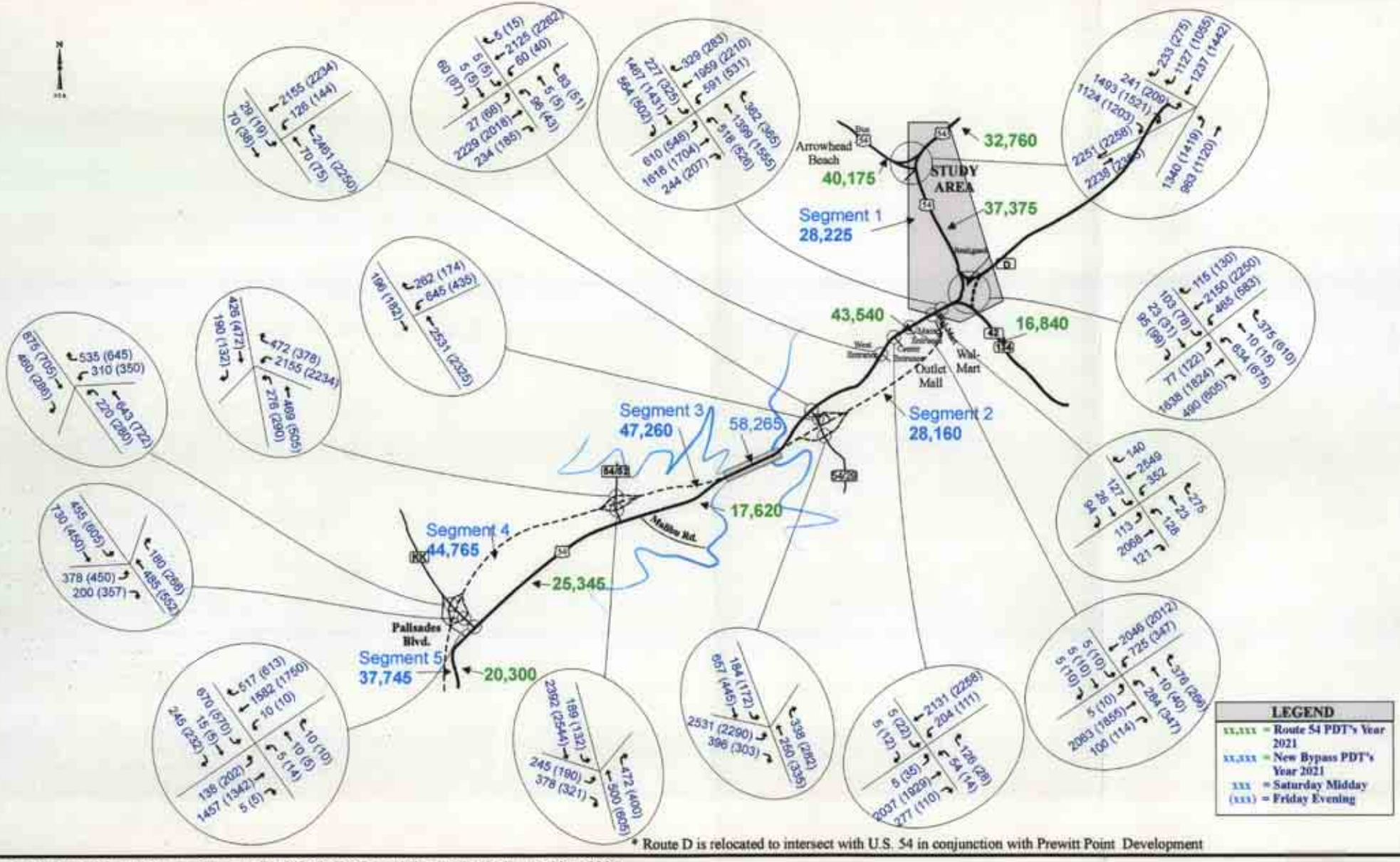
* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 16: Route 54 with Bypass



* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 17: Route 54 with Bypass Summer Peak Daily Traffic, Year 2001



* Route D is relocated to intersect with U.S. 54 in conjunction with Prewitt Point Development

Figure 18: Route 54 with Bypass Summer Peak Daily Traffic and Forecasted Volumes, Year 2021

Figure 19 - Traffic Growth Trends and Forecasts on US 54

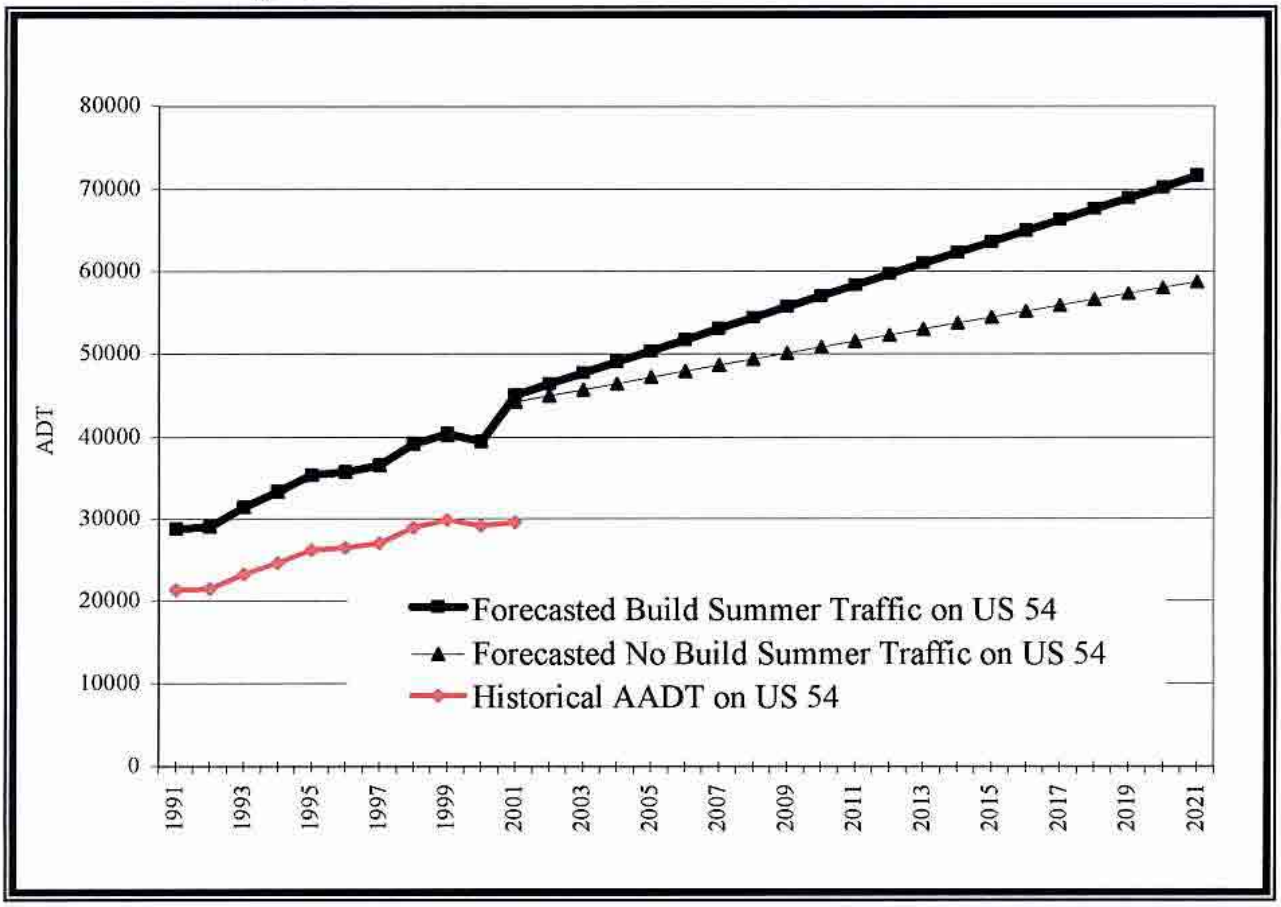


Figure 19 shows that the traffic projections for the build scenario are similar to the historical growth rate. As previously discussed, the no-build projections are slightly lower due to capacity constraints in the corridor.

The analysis of different alternatives and their operating conditions is discussed in detail in Chapters 5 and 6.

Chapter V - Evaluation of Alternatives

Several alternatives were developed to help improve traffic operations in the study area. Based on early analysis and feedback from the local community; four alternatives (in addition to the no build alternative) were brought forward for further review. The alternatives focused on alternate alignments for the proposed Route 54 Expressway (alignment A1 and C′) as well as alternate interchange configurations for the proposed interchange of existing Route 54 and the proposed Expressway. These alternatives are described in Table 11.

Table 11 - US 54 Expressway Scenarios and Alternatives

US 54 Expressway Scenarios		
Alternative	**Description**	
1	No Build	
Alternative	**Interchange Configuration at Existing Route 54**	**Alignment Through Study Area**
2	Single Point Interchange	A1
3		C′
4	One-Way Pair Interchange	A1
5		C′

It should be noted that both proposed interchange configurations are somewhat new to Missouri, especially to rural areas. As such, both are briefly described:

Although Single Point Urban Interchanges do not have a long history in Missouri, they have been used in the United States since the mid 1970's. The first Single Point Urban Interchange was opened on February 25, 1974 in Clearwater, Florida. Soon after, the second was opened in Moline, Illinois on September 9, 1975. Single Point Urban Interchanges contain one signalized intersection through which left-turn and through movements pass on the local road. The Single Point Urban Interchange is a safe, efficient interchange design that can decrease delay and congestion and, generally, uses less land area than other interchange types. In the St. Louis area, Single Point Urban Interchanges have been successfully installed at the I-55 Interchange at Lindbergh Boulevard, Manchester Road and Route 141 and at the Interchanges of I-70 at Cool Springs Road. The Single Point Urban Interchange planned for Route 54 Expressway can accommodate only four lanes of traffic on Business Route 54, due to right-of-way constraints.

One-way street pairs are a generally accepted practice for increasing arterial capacity. These generally increase a roadway's capacity by reducing conflicting movements at signalized intersections. While an intersection of two, two way streets has up to eight traffic signal phases, an intersection of two, one-way streets has only two traffic signal phases. Therefore, one-way street pairs allow motorists to travel from one end of the signalized corridor to the other with minimal stops at red lights. Thus, implementing a one-way street pair in conjunction with an urban diamond interchange reduces the number of phases at each intersection. Normally, at a traditional diamond interchange there are four phases, the one-way pair reduces the phases to

three. As at a single point interchange three phases are reduced to two. Moreover, the one-way pair interchange planned for the Route 54 Expressway can accommodate six lanes on Business Route 54 from Wal-Mart to Route 42, as well as a left-turn flyover ramp at the intersection of Route 42 and Existing Route 54.

It should be noted that Alignment A1 runs on the west side of existing Route 54 in the study area, and Alignment C′ runs on the west side of the existing Route 54 to a point south of Business 54, crosses over existing Route 54, and then runs to the east of existing Route 54 to its termini at the north of the study area. The Single Point Urban Interchange and One-way Pair Interchange for different alignments are shown in **Figures 20, 21, 22** and **23**.

Methodology

In addition to the HCM2000 methodologies for signalized and unsignalized intersections described in Chapter 2, a HCM2000 merge/diverge analysis was also used in this study. The primary performance for LOS in merge/diverge analysis is density for all cases of stable operation. The outcome is represented by LOS A through E. LOS F exists when the flow of traffic leaving the merge area exceeds the capacity of the travelway. The LOS criteria for merge diverge areas are listed in **Table 12**. The density values shown for LOS A through E assume a stable operation, with no breakdowns on the system.

Table 12 - Level-of-Service Criteria for Merge and Diverge Areas

Merge and Diverge LOS	
Level of Service	***Density Range (pc/mi/ln)***
A	0-10
B	>10-20
C	>20-28
D	>28-35
E	>35
F	Demand Exceeds Capacity

VISSIM was also used to evaluate the system operations. VISSIM is a microsimulation model that is used to analyze transportation systems that is effective for both freeway and arterial segments. System analysis is useful because it is not always meaningful to compare isolated intersections. For example, the one way pair interchange alternative contains 4 signalized intersections while single point urban interchange alternative consolidates all conflicts into one intersection. In order to compare the overall impact of traffic traveling through the interchange, it is necessary to evaluate system operations.

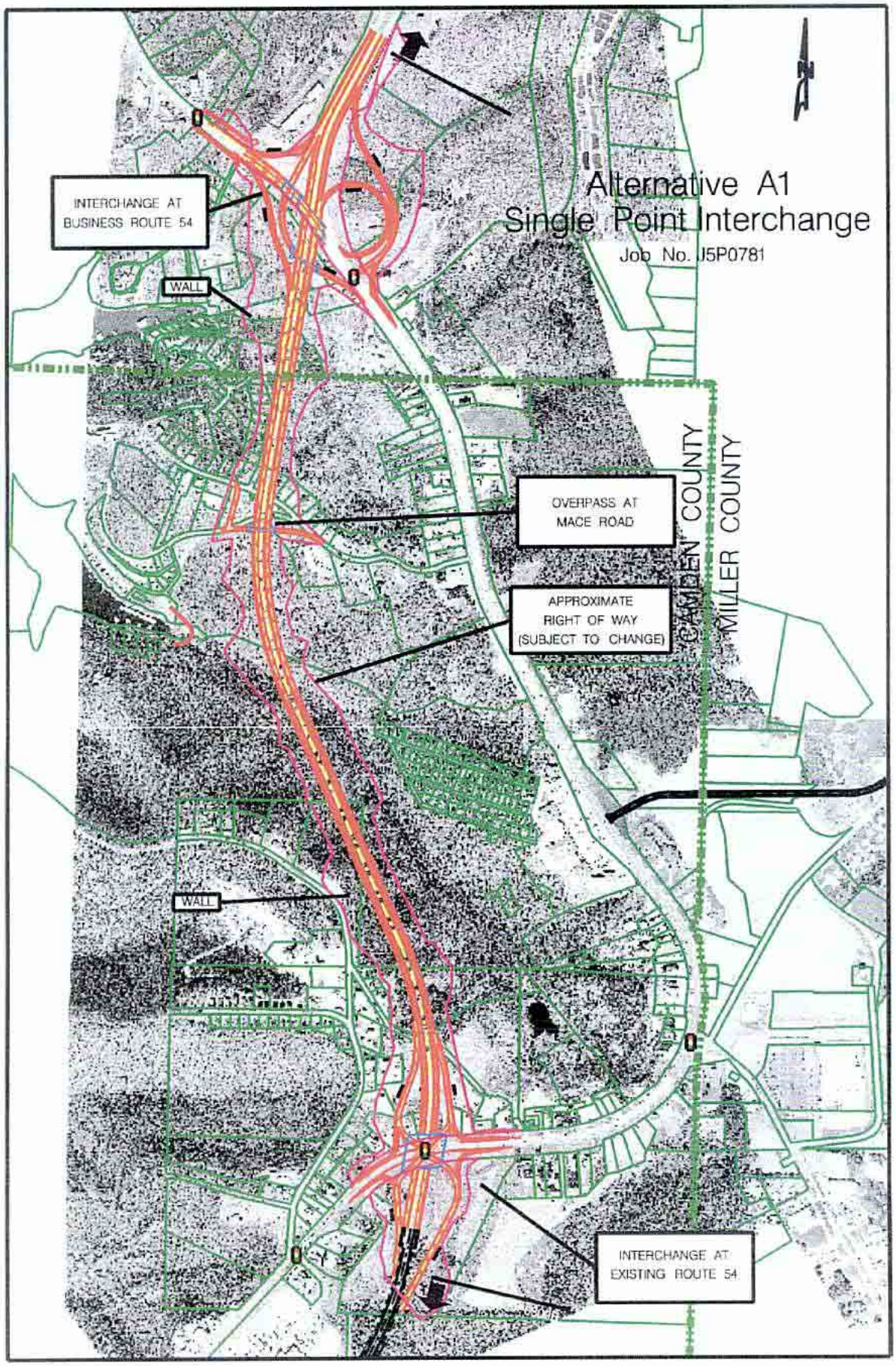


Figure 20 - Single Point Interchange with Alignment A1 (Alternative 2)

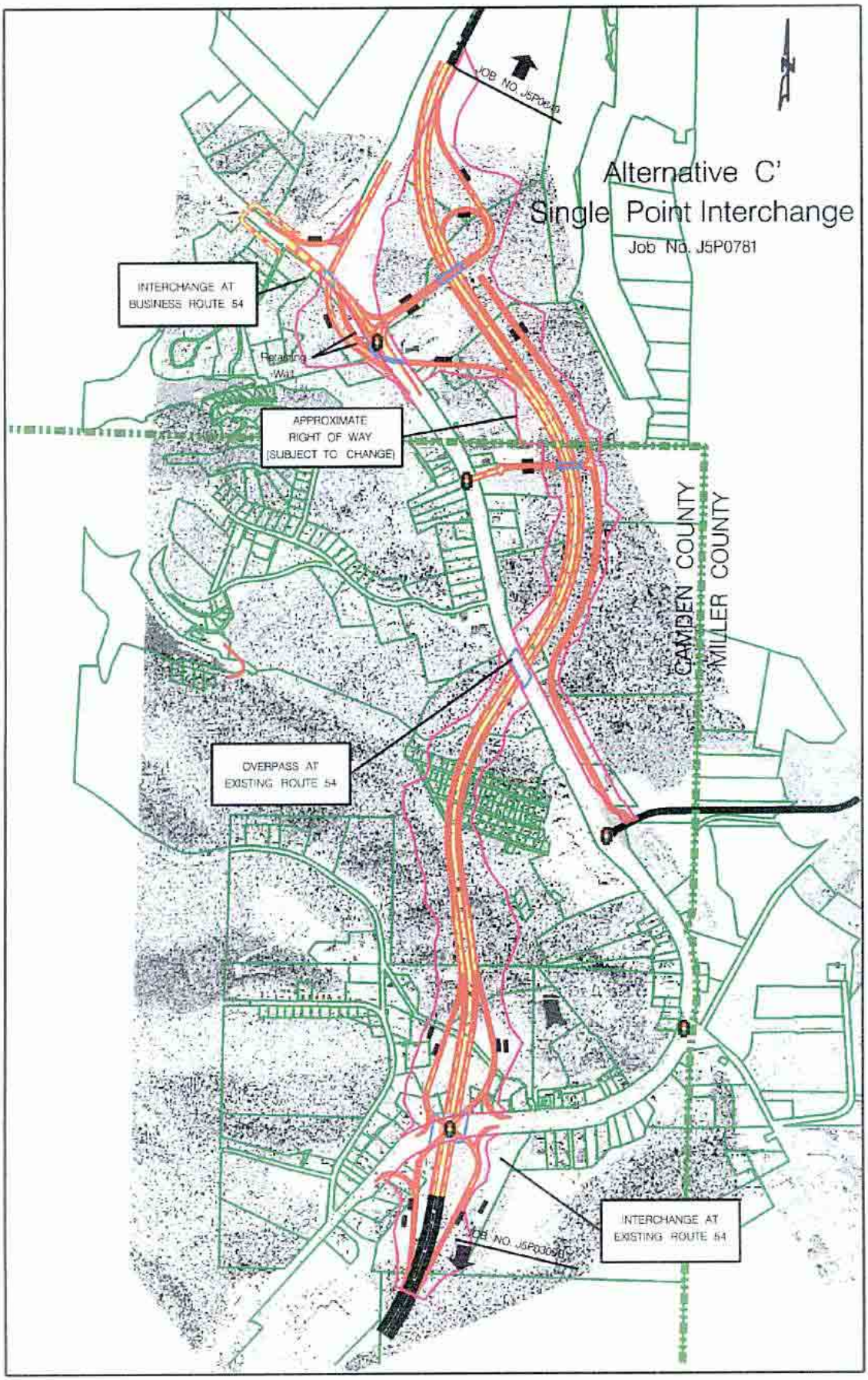


Figure 21 - Single Point Interchange with Alignment C' (Alternative 3)

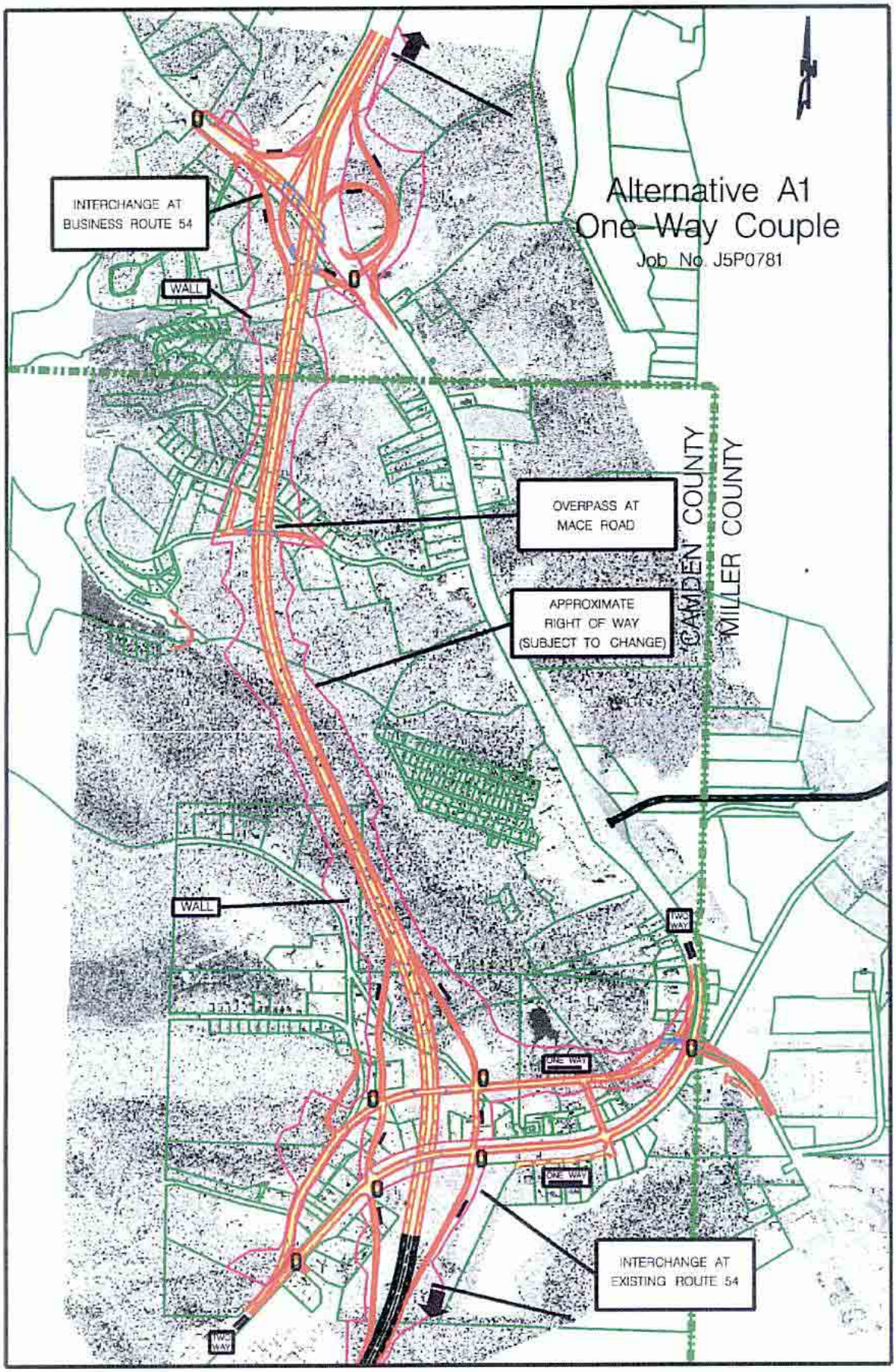


Figure 22 - One Way Couple, with Alignment A1 (Alternative 4)

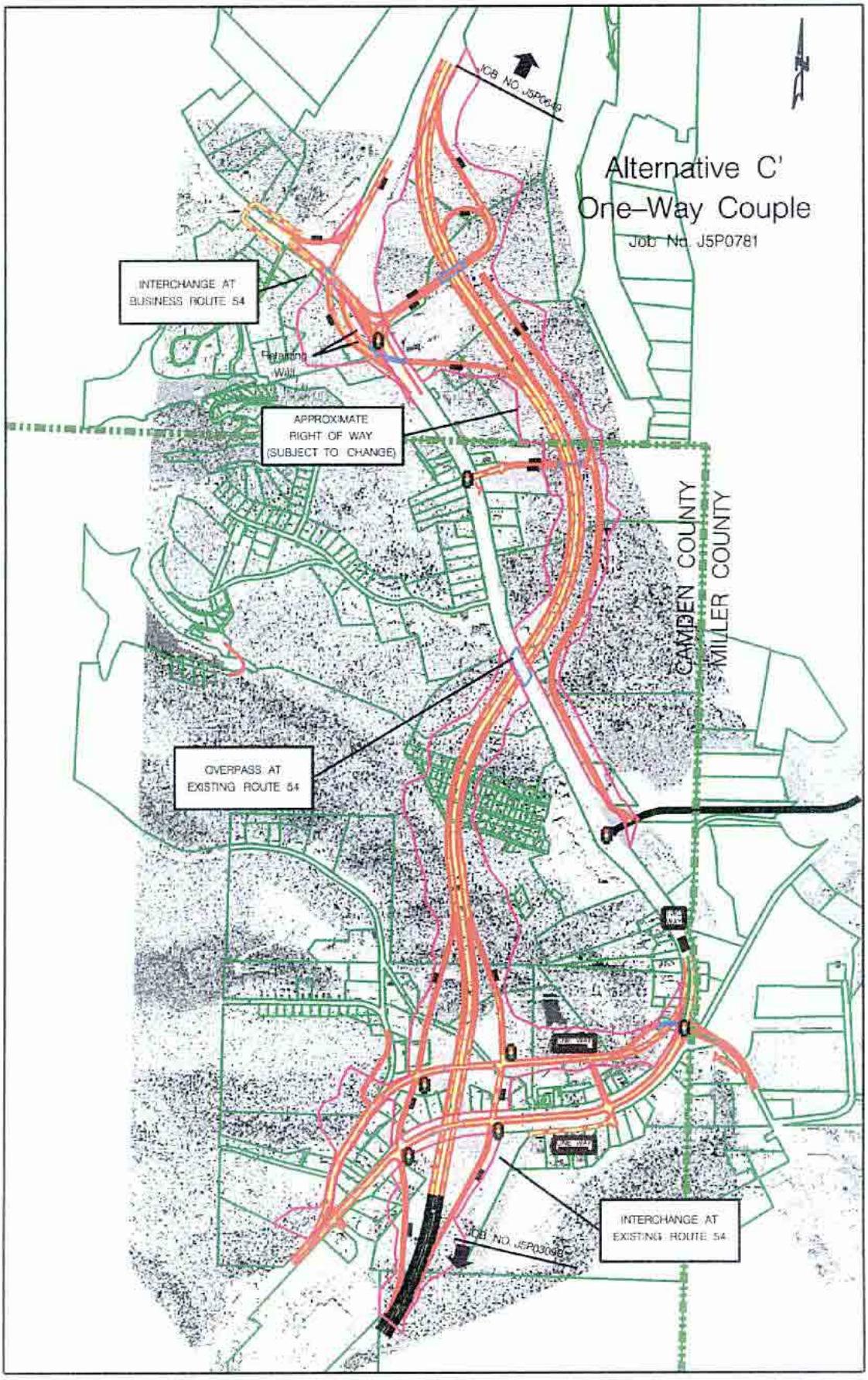


Figure 23 - One Way Couple with Alignment C' (Alternative 5)

Alternative 1 - No Build

Table 13 shows the future traffic conditions for the no build scenario.

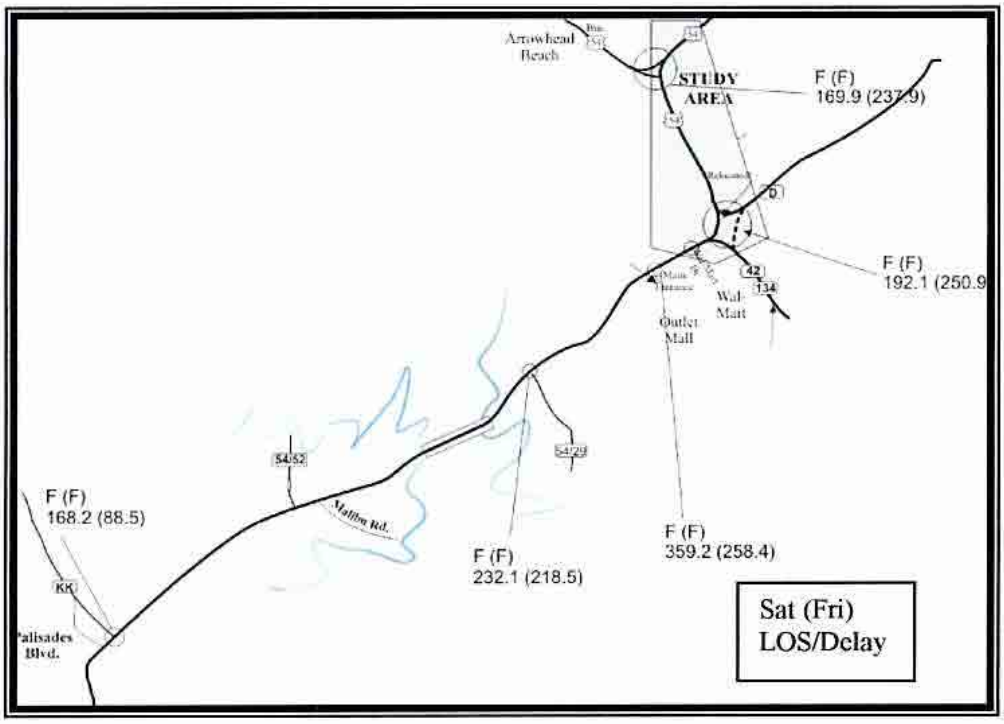
Table 13 –Forecasted 2021 No Build Traffic Operations, Summer Peak Hour

Location	Friday Evening Peak Hour		Saturday Midday Peak Hour	
	LOS	Delay	LOS	Delay
US 54/ Rte. 42	F	250.9	F	192.1
US 54/Bus. 54	F	237.9	F	169.9
US 54/ Passover Road	F	218.5	F	232.1
US 54/ Mall Main Entrance	F	258.4	F	359.2
US 54/ Rte KK	F	88.5	F	168.2

As can be seen from the above table, US 54 has essentially no remaining capacity. All the major intersections on US 54 fail to operate at an acceptable level of service.

Figure 24 shows the Level-of-service for all the intersections on existing Route 54

Figure 24 - Forecasted 2021 No Build Traffic Operations, Summer Peak Hour



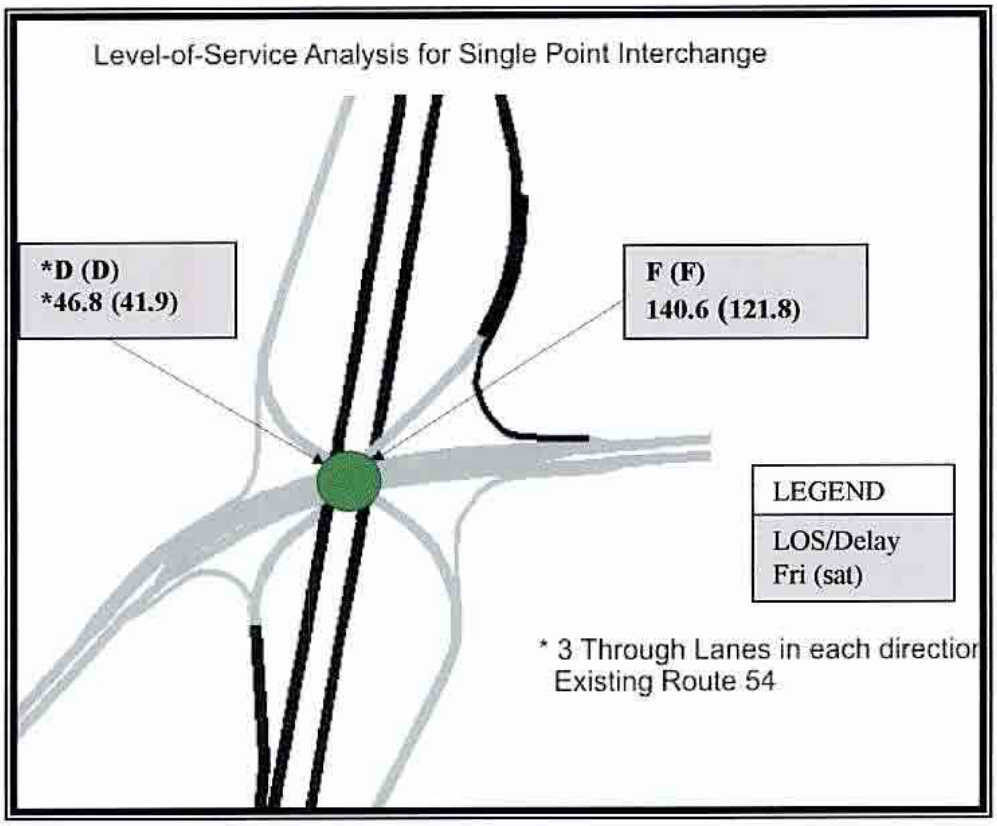
Alternative 2 – Single Point Interchange with Alignment A1

A single point interchange was analyzed with both four and six through lanes on the existing Route 54. As shown in **Table 14,** the single point interchange with four through lanes fails to accommodate all the local traffic during the peak hours. Although the six lane single point interchange works at an acceptable level, it is not feasible to add an extra lane in each direction along existing Route 54 without destroying many local businesses due to right-of-way constraints. The level-of-service is shown in **Figure 25**.

Table 14 - Forecasted 2021 Summer Traffic Conditions for Single Point Interchange

	Friday PM		Saturday Midday	
	LOS	**Delay**	**LOS**	**Delay**
4 thru lanes on Route 54	F	140.6	F	122
6 thru lanes on Route 54	D	46.8	D	42

Figure 25 - Forecasted 2021 Summer Traffic Conditions for Single Point Interchange



The north interchange for alignment A1 has a signalized intersection for the southbound lefts and the through movements on the existing Route 54. The construction of this alignment requires right-of-way and would impact the businesses along the existing Route 54. The interchange was analyzed using HCS 2000 merge/diverge analysis. The level-of-service is shown in **Figure 26**.

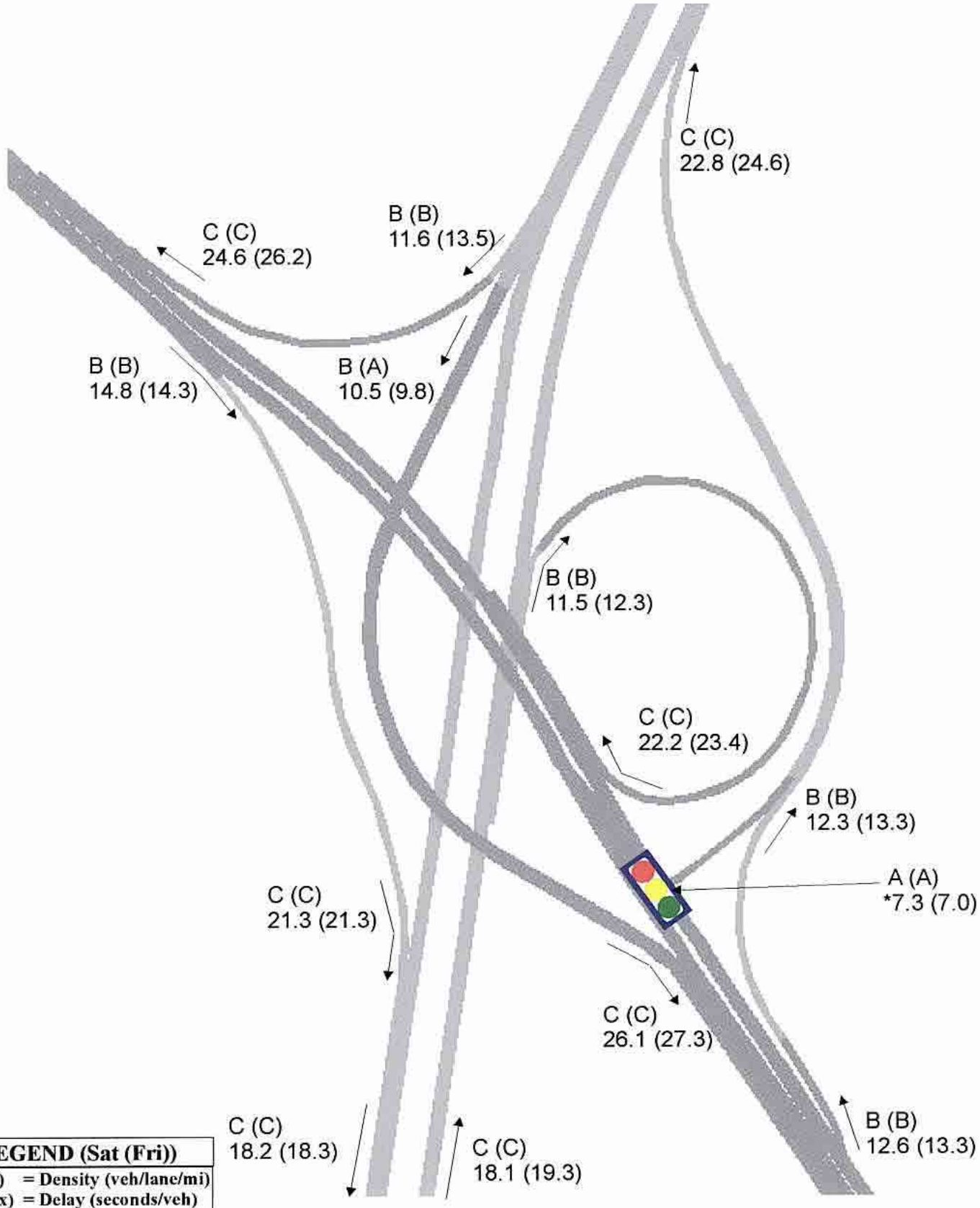
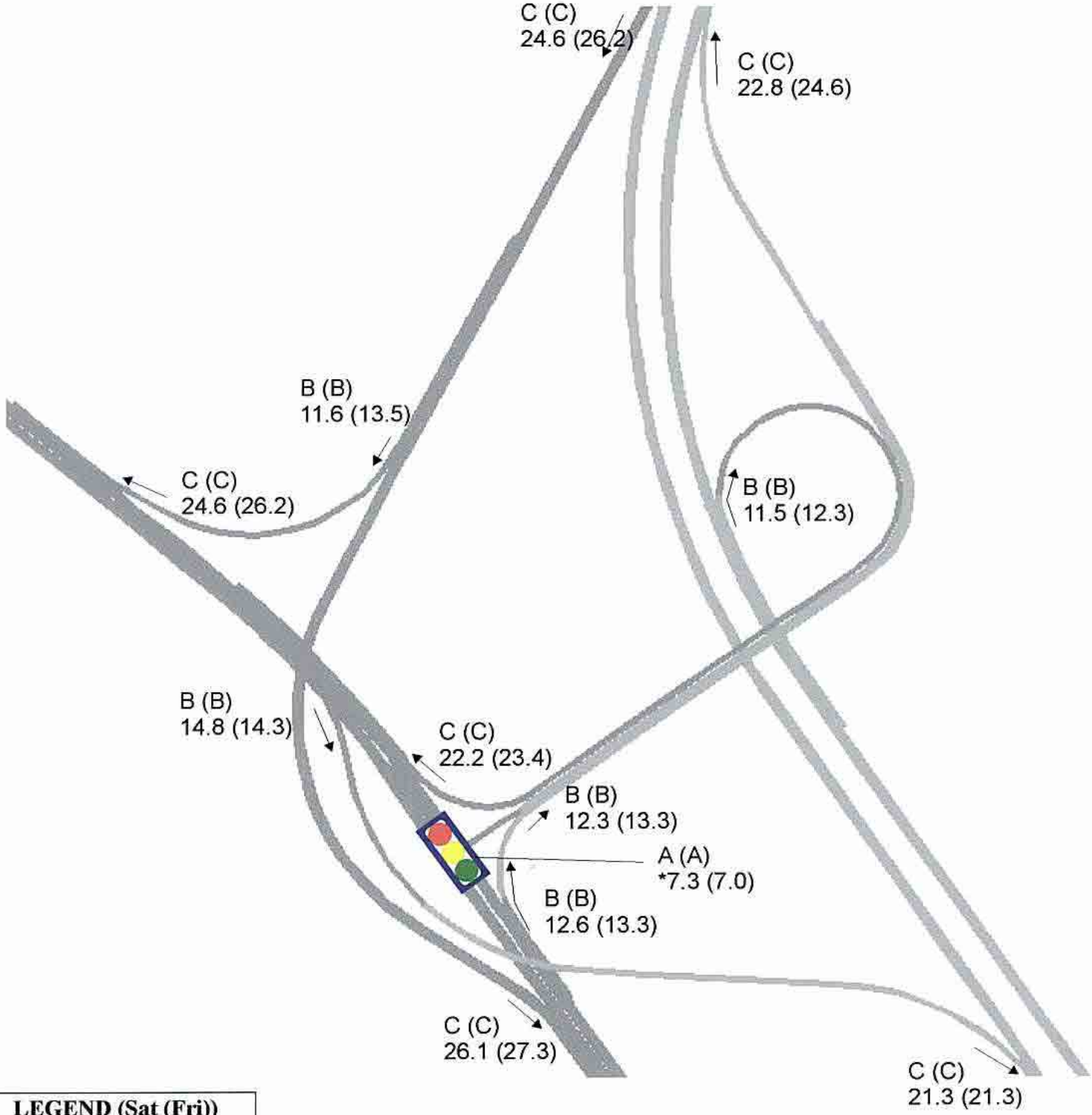


Figure 26 - Alternative A1 North Interchange
2021 Summer Peak Projected Level-of-service

Alternative 3 - Single Point Interchange with Alignment C'

Because the Single Point Interchange will operate identically in Alternatives 2 and 3, this section focuses on operation of the proposed expressway's connection with Business Route 54 under C' Alignment. As discussed earlier in this Chapter, Alignment C' runs on the west side of the existing Route 54 to a point south of Business 54, crosses over existing Route 54, and then runs to the east of existing Route 54 to its termini at the north of the study area.

The north interchange for alignment C' is shown in **Figure 27**, with the level-of-service operating conditions. This interchange has a signal for the southbound lefts and through movements on existing Route 54.



LEGEND (Sat (Fri))	
xx(xx)	= Density (veh/lane/mi)
*xx(xx)	= Delay (seconds/veh)
A(B)	= LOS

Figure 27 - Alternative C' North Interchange
Summer Peak Projected Level-of-service

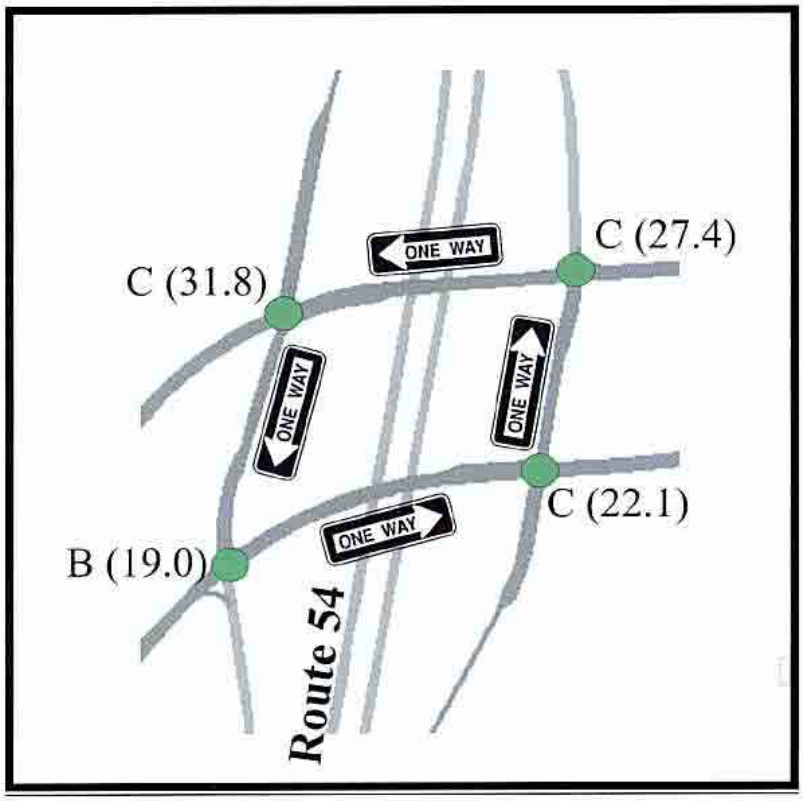
Alternative 4 - One-Way Pair Interchange with Alignment A1

One-way pair interchange has three lanes in each direction and was analyzed for the PM peak hour (Friday evening), which is the critical period during the day. The results of capacity analysis for the one-way pair interchange are shown in **Table 15** and **Figure 28**, which show that the one-way pair interchange works at a good LOS.

Table 15 - Forecasted 2021 Summer Peak Hour Traffic Conditions for One-Way Couple

Intersection	LOS	Delay
Expressway NB On-Ramp @ Bus Route 54	C	27
Expressway NB Off-Ramp @ Bus Route 54	C	22
Expressway SB On-Ramp @ Bus Route 54	B	19
Expressway SB Off-Ramp @ Bus Route 54	C	32

Figure 28 - Level-of-Service for One-Way Pair Interchange



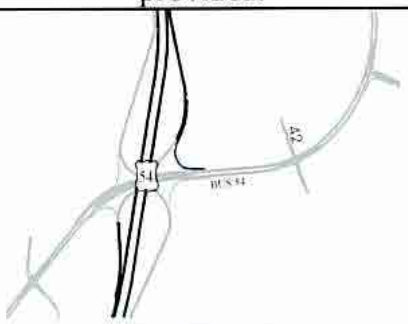
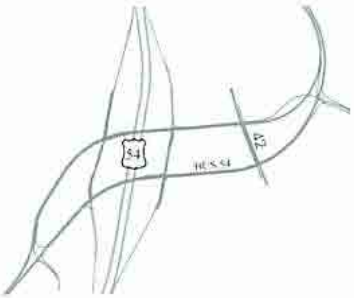
Alternative 5 – One-Way Pair Interchange with Alignment C'

The one-way pair is the same as discussed in Alternative 4, with alignment C'.

Study Area Analysis Conclusions

Comparison between the Single Point Urban Interchange and the One-Way Pair - **Table 16** shows that the single point interchange concept fails due to a lack of capacity and results in greater motorist delay as compared to the one-way pair interchange.

Table 16 – 2021 Comparisons of Single Point and One-Way Pair Interchanges

Comparison of Single Point and One-Way Pair Interchanges		
Description	**Single Point Interchange**	**One-Way Pair Interchange**
Level of Service	F	B-C
Intersection Delay (SYNCHRO) (seconds/ per Vehicle)	141 (PM Peak)	32 (PM Peak)
Average Interchange Delay (VISSIM) (seconds/ per Vehicle)	144 (PM Peak)	28 (PM Peak)
Max V/C Ratio	1.48	0.85
Travel Time from Route 42 to Wal-Mart on Existing Route 54	8 minutes	2 minutes
Number of lanes	Due to right-of-way constraints, only 2 lanes in each direction on existing Route 54 can be provided.	3 lanes in each direction on existing Route 54
Interchange Layout		

VISSIM representations of queues and delays for Single Point and One-Way Pair Interchanges as produced in VISSIM are shown in **Figures 29-31**.

Figure 29 - Queues in Single Point Interchange; 2021 – Summer Peak

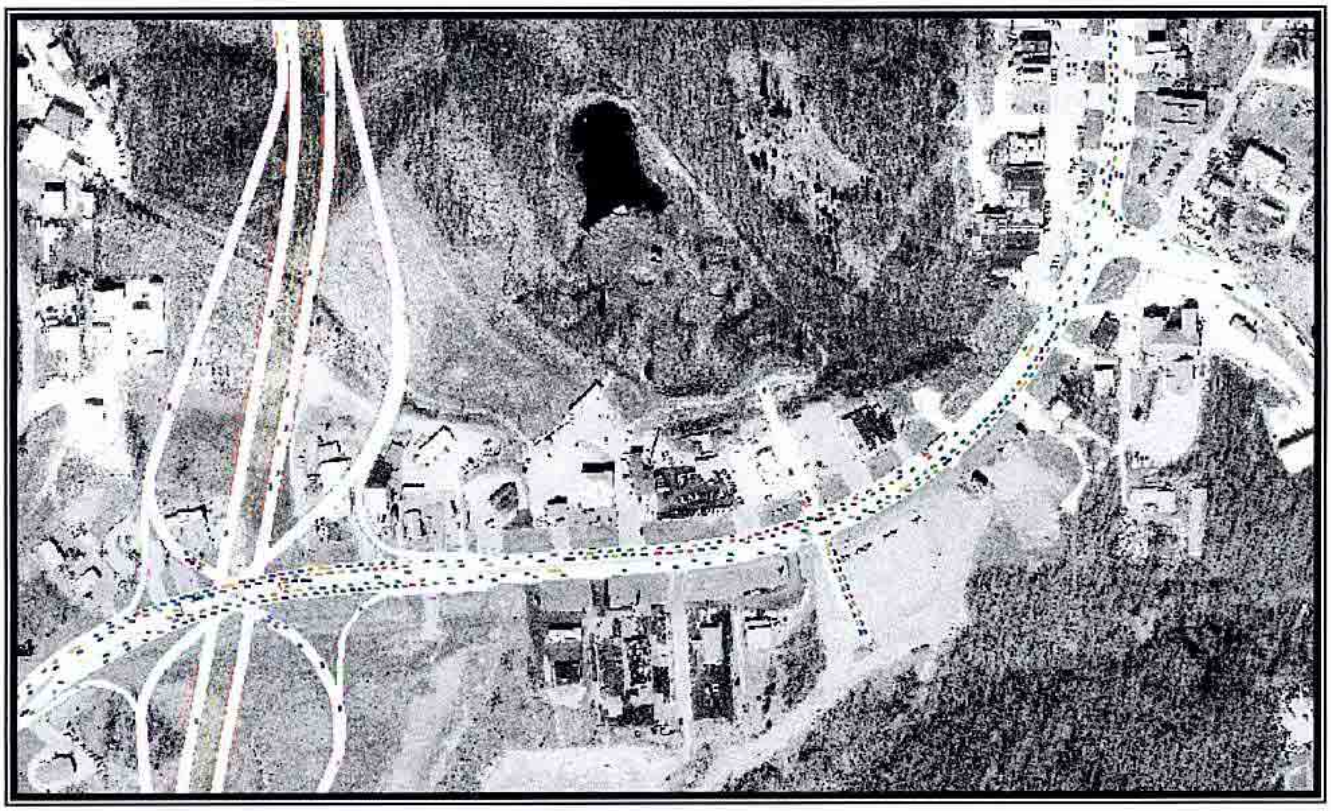


Figure 30 - Close View of the Single Point Interchange; 2021 Summer Peak

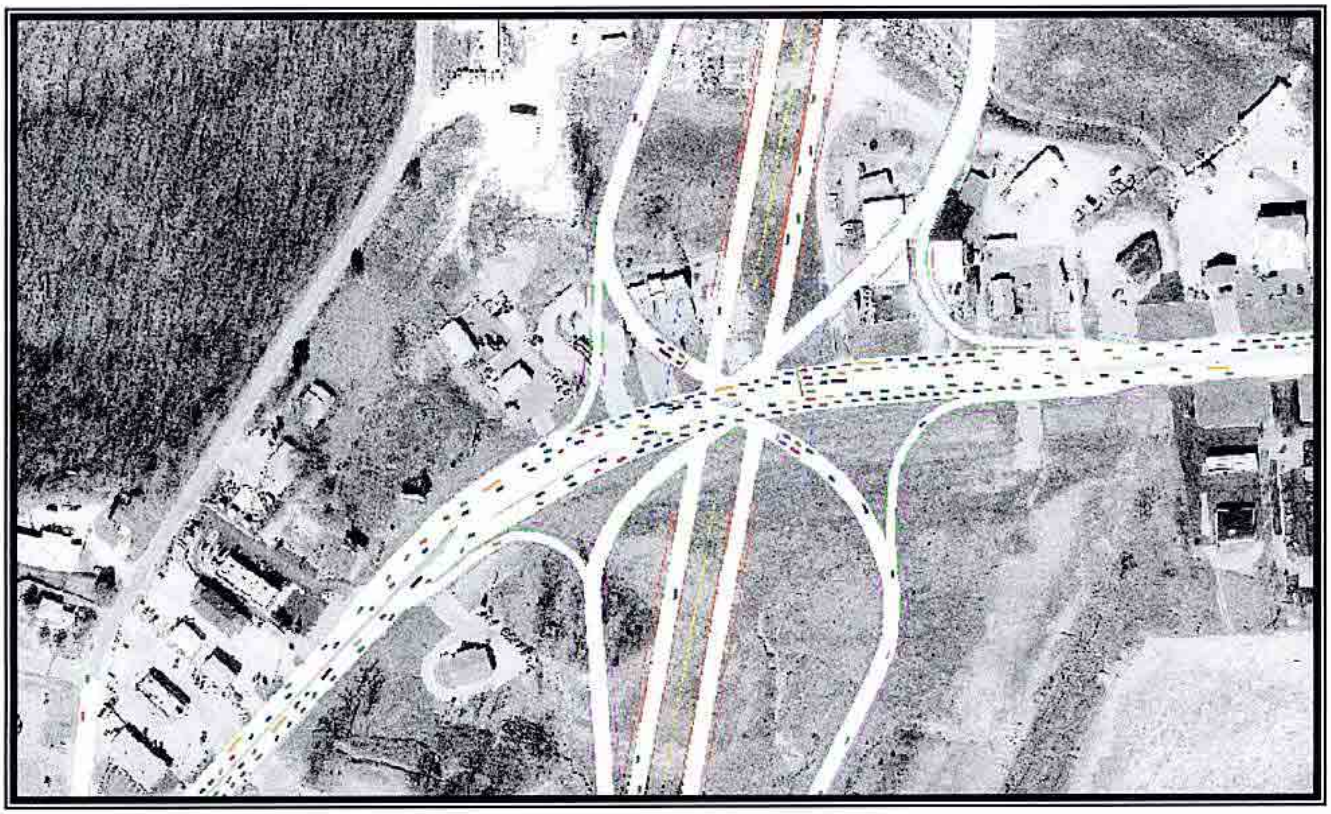
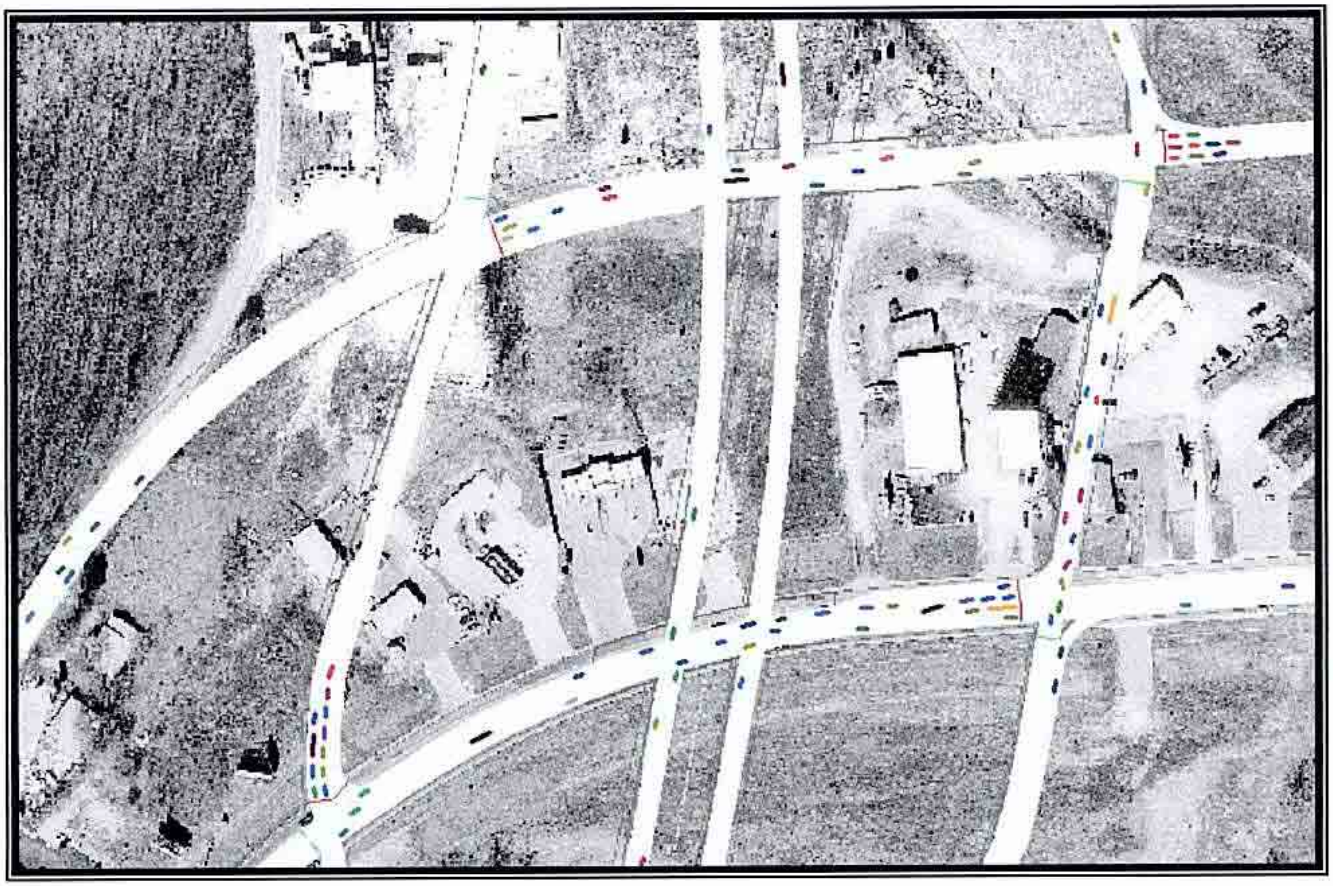


Figure 31 - Close View of the One-Way Pair Interchange; 2021 Summer Peak



VISSIM representations of queues and delays for Alignments A1 and C' as produced in VISSIM are shown in **Figures 32** and **33**.

Analysis for some areas outside of the study area that is of value for planning efforts in the Route 54 corridor is discussed in Chapter 6.

Figure 32 - North Interchange, Alignment A1; 2021 Summer Peak

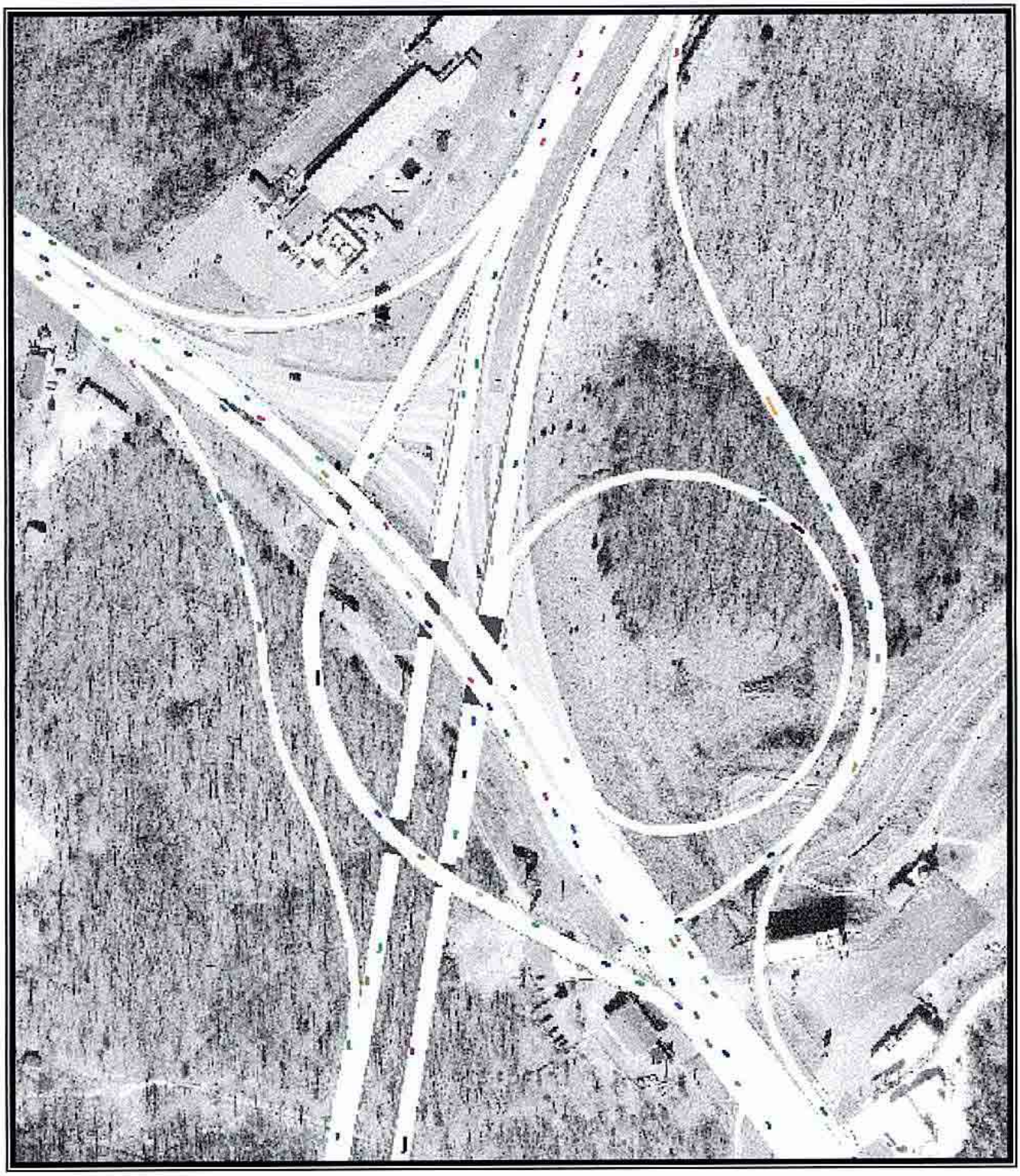
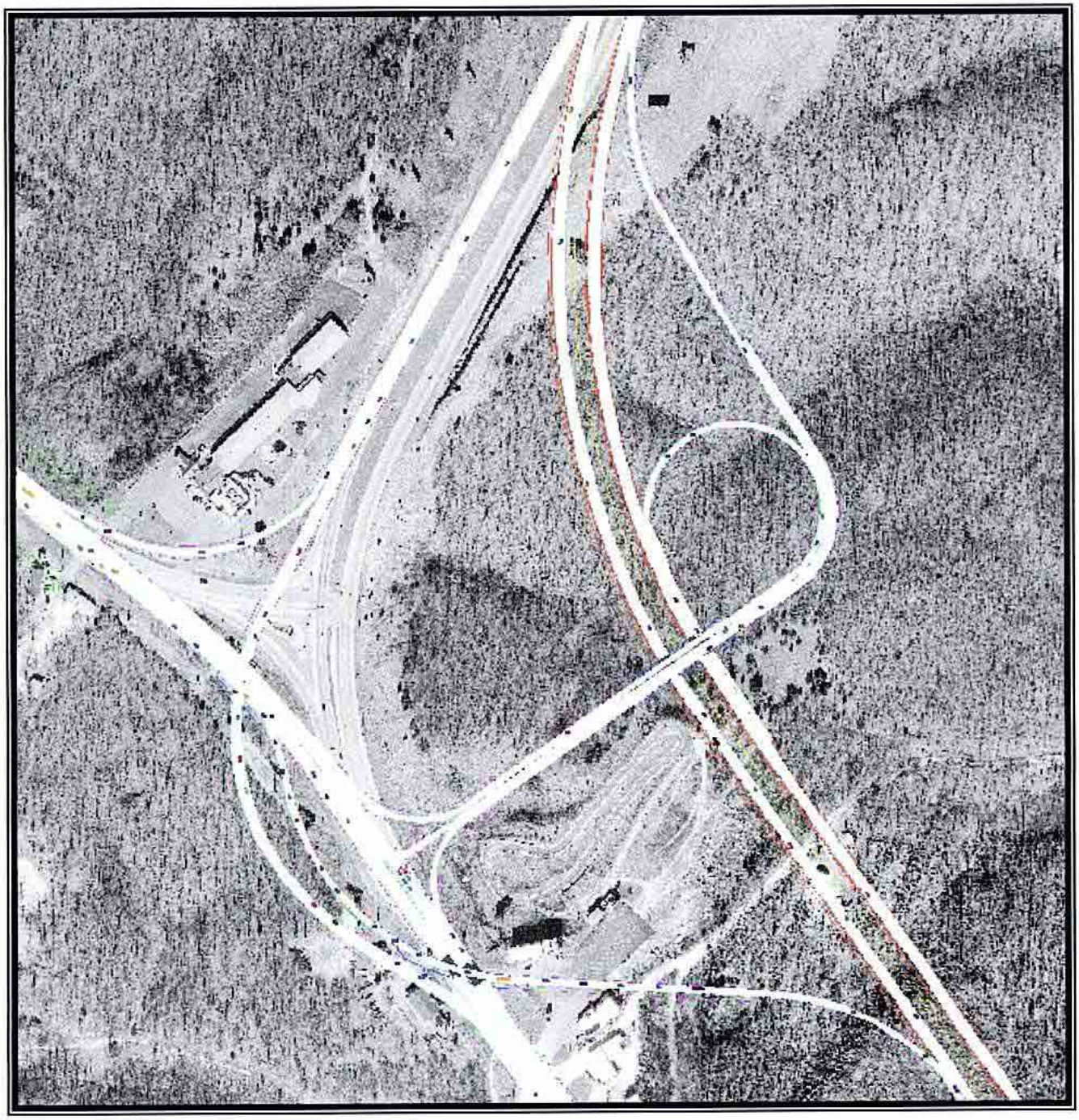


Figure 33 - North Interchange, Alignment C′; 2021 Summer Peak



Chapter VI - Other Analysis Outside of the Study Area

Some supporting analysis was completed during the project for areas outside of the study area. Because this analysis is of value for planning efforts in the Route 54 corridor, the results are summarized in the following Chapter.

- US 54 South of the Study Area
- Interchange at Route 54 Expressway and Hatchery Road
- Expressway and Business 54 Interchange at the Grand Glaize Creek Bridge

US 54 South of Study Area

US 54, currently is a four-lane road operating at an acceptable LOS. As discussed in the no build scenario, US 54 fails to operate at an acceptable LOS in the forecasted year 2021. MoDOT has been developing a program of improvements to US 54 at Osage Beach/Lake Ozark's areas. The improvement plans developed to improve US 54 in other sections include:

1. From Lakeland to just north of Business 54, including a new bridge over the Osage river (MoDOT Job Number J5P0649);
2. From south of Route 42 to north of Grand Glaize Bridge (MoDOT Job Number J5P0309B, C and D); and
3. From south end of Grand Glaize Bridge to the south corporate limit of Osage Beach (MoDOT Job Number J5P0347B and E).

Some of the 2001 failing intersections for 2021 summer peak no-build condition are shown in **Table 17.**

Table 17 – 2021 Summer Peak Forecasted Traffic Conditions on US 54 for Build Scenario

	Friday PM Peak		Saturday Midday	
	LOS	**Delay**	**LOS**	**Delay**
Business 54 @ Existing Route 54	F	154.8	F	109.0
Route 42 @ Existing Route 54	F	188.8	E	100.8
Mall Main Entrance @ Existing Route 54	F	99.5	F	178.4
Route KK @ Existing Route 54	E	69.8	F	89.5
Passover Rd @ Existing Route 54	F	138.5	F	182.8
Mall West Entrance @ Existing Route 54				
Eastbound Left-Right	F	*	F	*
Westbound Left	F	*	F	*
Westbound Right	F	*	F	*

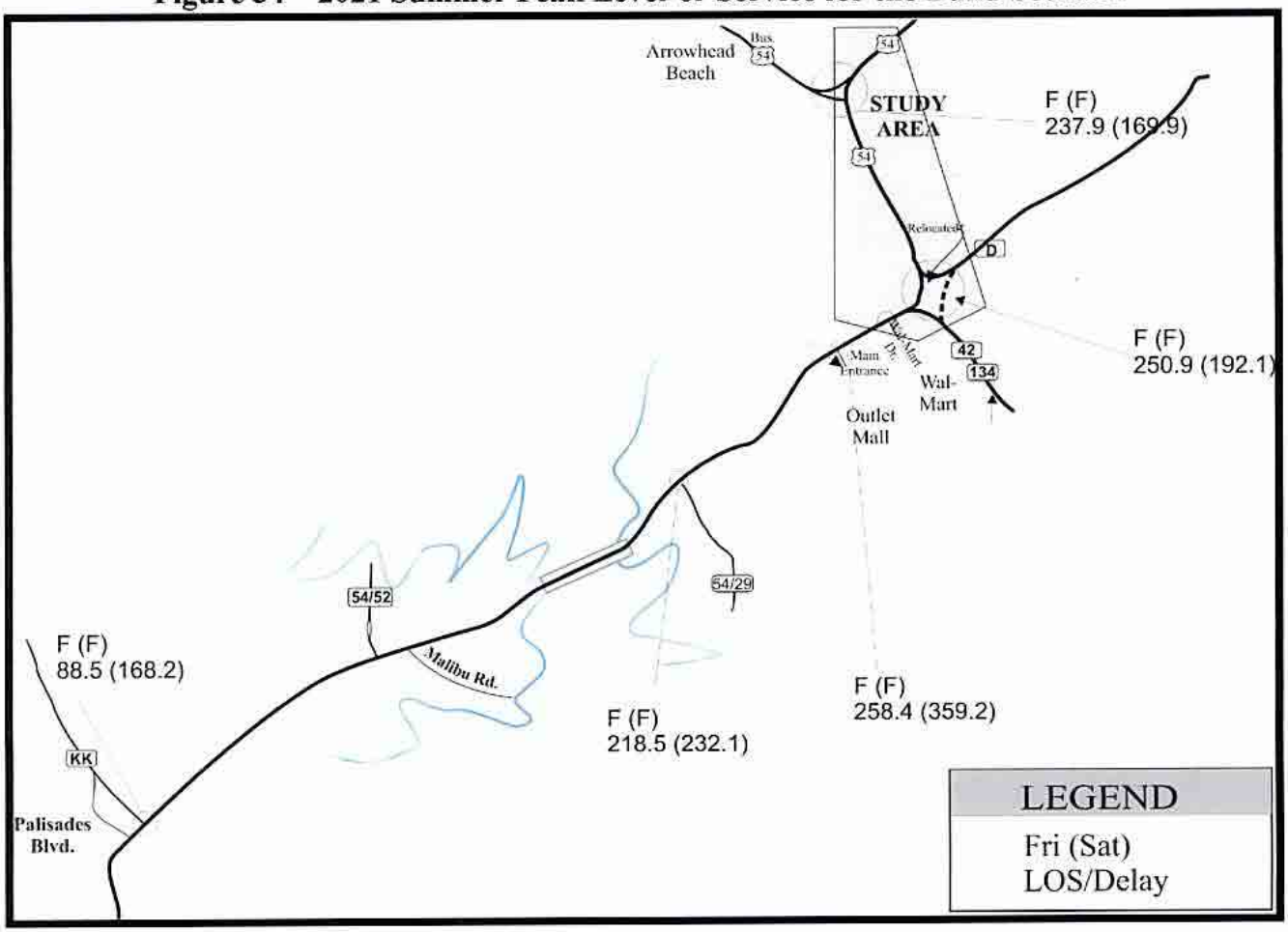
Even with the build alternative, some areas of existing Route 54 are likely to fail due to capacity constraints in the local roadway system. The results of the analyses indicate that under the build scenario US 54 fails to operate at acceptable LOS, though average control delay dropped significantly. The forecasted traffic conditions for the US 54 expressway are shown in **Table 18**.

Table 18 – 2021 Summer Peak Level of Service for Future Build Alternative New Route 54

	Friday PM Peak		Saturday Midday	
	LOS	**Delay**	**LOS**	**Delay**
Route 54 EB Ramps @ 54/52	D	41.7	D	35.7
Route 54 WB Ramps @ 54/52	F	120.0	F	100.9
Route 54 EB Ramps @ Passover Road	F	123.7	F	161.5
Route 54 WB Ramps @ Passover Road	D	38.0	E	64.9
Route 54 EB Ramps @ Route KK	D	44.6	C	33.0
Route 54 WB Ramps @ Route KK	C	28.8	C	31.1

From **Table 18**, the results indicate that Passover Road and Lake Road 54/52 fail to operate at acceptable level-of-service. The heavy left-turn movements on the new alignment as the existing US 54 will be a one way from Lake Road 54/52 to Passover Road caused that movement and the intersections to fail. One of the recommended changes to existing intersections is providing a loop ramp (northbound to eastbound) at Passover Interchange. The levels-of-service for various intersections on Route 54 and Route 54 Expressway are shown in **Figure 34**.

Figure 34 – 2021 Summer Peak Level-of-Service for the Build Scenario



Merge Ramps at Grand Glaze Bridge

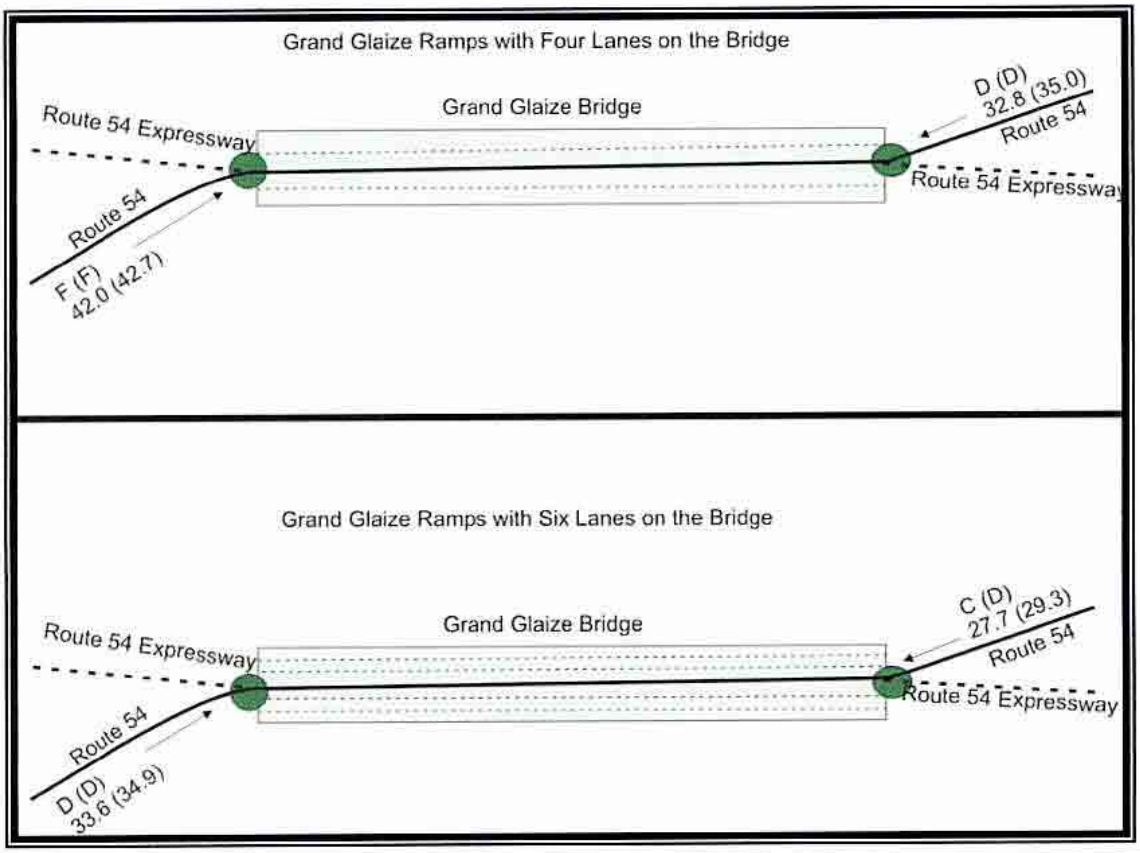
We also reviewed the proposed merge ramps at the Grand Glaize Bridge under two scenarios: 1) Grand Glaize as two lanes in each direction; and 2) Grand Glaize as two lanes plus an additional third lane picked up at the ramp merge.

Merge analysis of Grand Glaize Bridge ramps were performed to calculate the measures of level-of-service. The results are included in **Table 19**. As can been seen in the table, the ramp movements would operate poorly under the two lane scenario, but the inclusion of the third lane, which is possible without widening the bridge structure, would improve the level-of-service to acceptable levels. The merge analysis is shown in **Figure 35**.

Table 19 – 2021 Summer Peak Forecasted Traffic Conditions of Grand Glaize Ramps

	Friday PM Peak		Saturday Midday	
	LOS	**Density (PC/MI/LN)**	**LOS**	**Density (PC/MI/LN)**
NB Merge Ramp (2 lanes)	F	42.7	F	42.0
NB Merge Ramp (3 Lanes)	D	34.9	D	33.6
SB Merge Ramp (2 lanes)	D	35.0-	D	32.8
SB Merge Ramp (3 Lanes)	D	29.3	C	27.7

Figure 35 – 2021 Summer Peak Merge Analysis of Grand Glaize Ramps



Hatchery Road Interchange Options

As discussed in Chapter 4, existing Route 54 is likely to fail due to a lack of local roadway capacity if a single point urban interchange is used for the interchange of the expressway and existing Route 54. As such, alternatives were considered to relieve pressure on existing Route 54 under this configuration. Specifically, an interchange at Hatchery Road was considered.

The following scenarios were reviewed:

- Half Interchange (westbound (northbound) movements only)
- Half Interchange (eastbound (southbound) movements only)
- Connect Hatchery Road to College Boulevard at Route 42
- Connect Hatchery Road to College Boulevard at Route 42 with full interchange.

The impacts of these alternatives on the intersection of Route 54 Expressway and the existing Route 54 are shown in **Tables 20-23**. Each table includes the following scenarios:

- Two lanes on the existing Route 54
- Three lanes on the existing Route 54
- Combination Partial Cloverleaf with Single Point Interchange and two lanes on existing Route 54.
- Combination Partial Cloverleaf with Single Point Interchange and three lanes on existing Route 54.

Table 20 – 2021 Summer Peak Forecasted Level of Service (NB Ramps at Hatchery Road)

	Friday PM Peak		Saturday Midday	
	LOS	Delay	LOS	Delay
Expressway @ Bus Route 54(3 thru lanes on 54)	D	39.5	D	39.1
Expressway @ Bus Route 54(2 thru lanes on 54)	F	102.5	F	80.3
Expressway @ Bus Route 54(SPUI-2 thru)	C	32.9	B	18.9
Expressway @ Bus Route 54(SPUI-3 thru)	B	14.2	B	12.2

Table 21 – 2021 Summer Peak Forecasted Level of Service (SB Ramps at Hatchery Road)

	Friday PM Peak		Saturday Midday	
	LOS	Delay	LOS	Delay
Bypass Ramps @ Route 54(3 thru lanes on 54)	D	40.3	D	39.4
Bypass Ramps @ Route 54(2 thru lanes on 54)	F	120.8	F	101.7
Bypass Ramps @ Route 54(SPUI-2 thru)	E	63.3	D	33.9
Bypass Ramps @ Route 54(SPUI-3 thru)	B	13.3	B	11.9

Table 22 - 2021 Summer Peak Forecasted Level of Service– Local Road

	Friday PM Peak		Saturday Midday	
	LOS	**Delay**	**LOS**	**Delay**
Bypass Ramps @ Route 54(3 thru lanes on 54)	D	35.4	D	36.5
Bypass Ramps @ Route 54(2 thru lanes on 54)	D	46.9	D	45.7
Bypass Ramps @ Route 54(SPUI-2 thru)	B	15.1	B	13.8
Bypass Ramps @ Route 54(SPUI-3 thru)	B	11.1	B	10.8

Table 23 – 2021 Summer Peak Forecasted Level of Service– Local Road (with Interchange)

	Friday PM Peak		Saturday Midday	
	LOS	**Delay**	**LOS**	**Delay**
Bypass Ramps @ Route 54(3 thru lanes on 54)	C	33.2	C	34.4
Bypass Ramps @ Route 54(2 thru lanes on 54)	D	36.7	C	34.8
Bypass Ramps @ Route 54(SPUI-2 thru)	B	14.9	B	13.5
Bypass Ramps @ Route 54(SPUI-3 thru)	B	10.7	B	10.3

The results show that while the additional interchange by itself would improve operations at the Route 54 expressway and the existing Route 54 interchange, only the extension of a local road connecting the Hatchery Road would remove a sufficient amount of trips from the intersection to improve projected LOS to an acceptable level in the design year under two lane scenario with a single point interchange.

Based on this analysis, an additional interchange at Hatchery Road would improve the LOS at the Route 54 expressway and the existing Route 54 interchange, but insufficiently to warrant the addition of this interchange at this time. It would be more important to help the City of Osage Beach make a local road connection by providing right-of-way, fill material, or additional bridging on the Expressway in conjunction with the expressway project. After the City completes the addition of a local collector road, consideration for access at Hatchery Road could be made.

One exception is the possible inclusion of a westbound (northbound) off-ramp that would relieve heavy projected turning movements at Passover Road, which will be congested even if previous recommendations for conversion of the proposed westbound (northbound) left turns to a loop ramp are implemented.

The different options for the Hatchery Road Interchange are shown in **Figures 36** and **37**.

Figure 36 - Hatchery Road with Half Interchanges

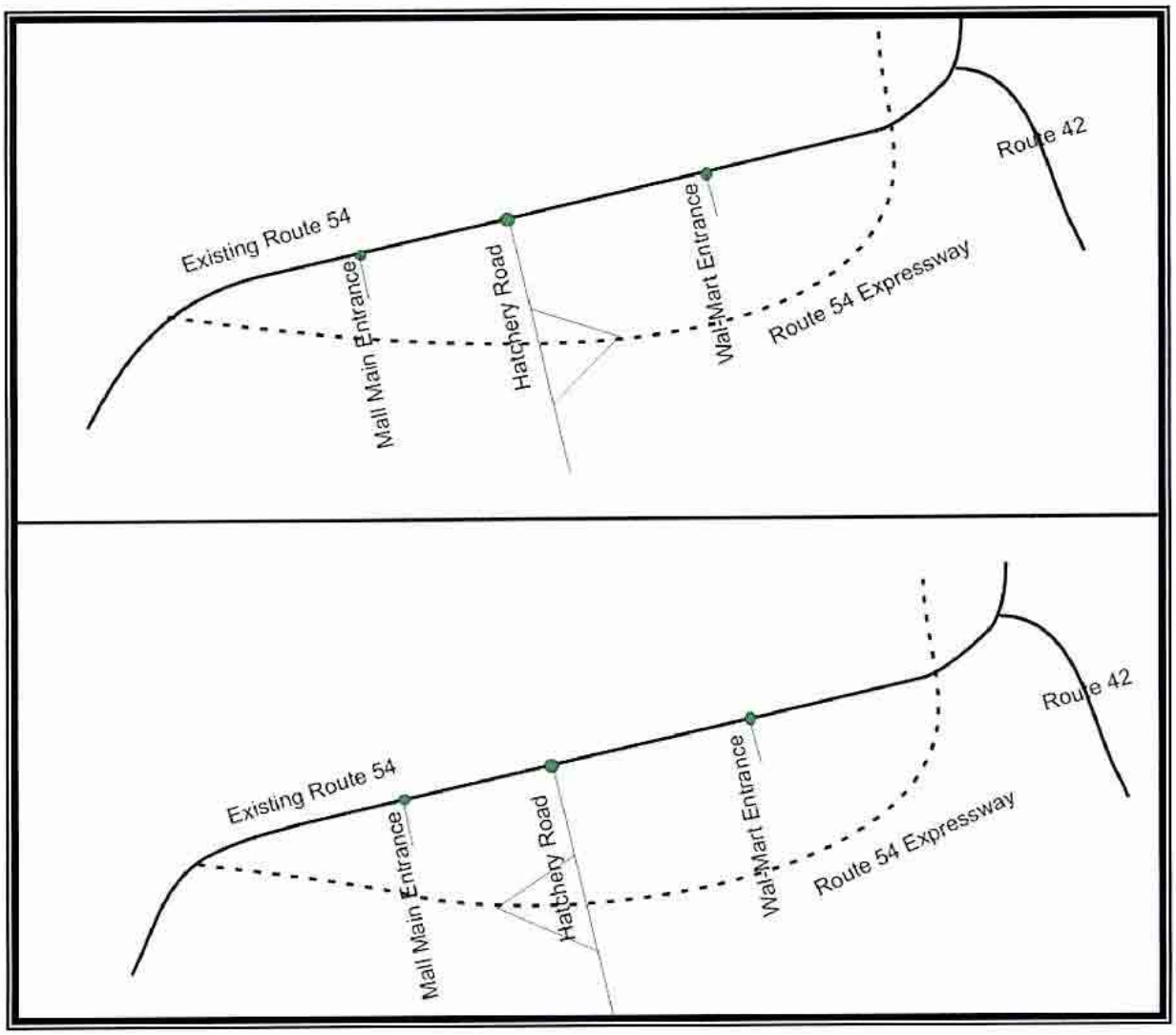
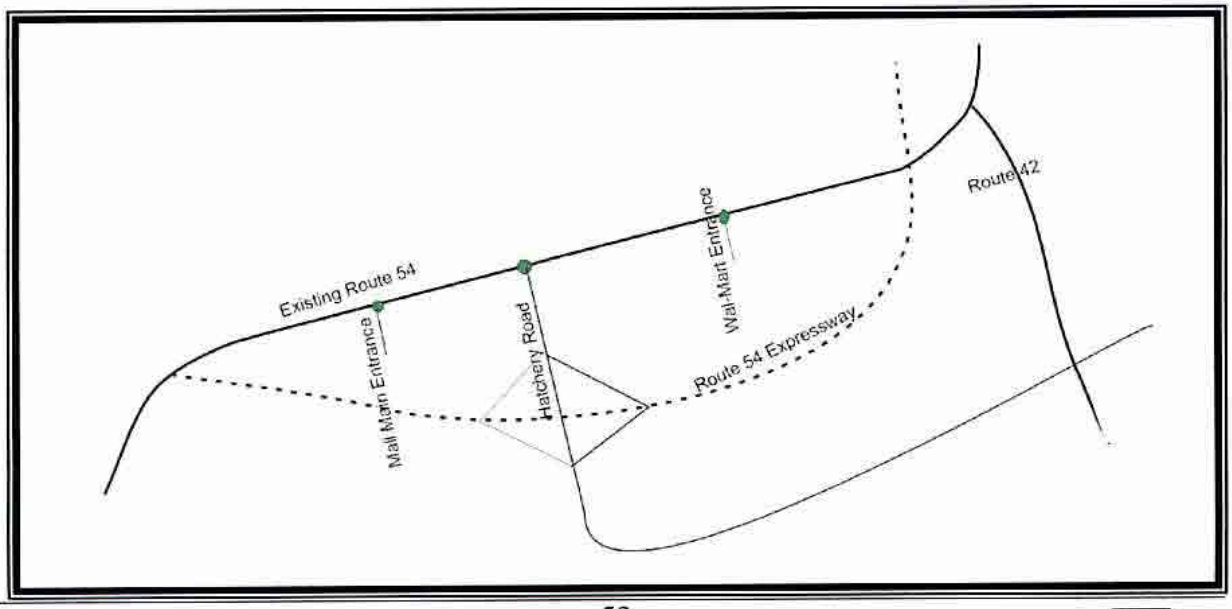


Figure 37 - Hatchery Road Extension to College Boulevard with Full Interchange



Chapter VII – Conclusions/Recommendations

Based on our analysis, the following recommendations are made:

1. Develop a one-way pair on Existing Route 54 at the Interchange of the Route 54 Expressway and existing Route 54 in lieu of a Single Point Interchange.

2. Either A1 or C` are acceptable from a pure traffic standpoint. Although, other considerations may need to be addressed. (e.g. cost, environmental impacts, local impacts and etc.) These considerations are being considered in another study.

3. If a single point interchange at the Route 54 Expressway and existing Route 54 is used, support of a City development of a parallel collector road along Route 54 (from Hatchery Road to Route 42) is recommended. Heavy through trips on existing 54 prohibit the intersection of the Route 54 Expressway and the existing Route 54 interchange from operating at acceptable levels-of-service during the busiest days of the year. Necessary improvements to operate at acceptable levels-of-service include widening the existing Route 54 to three lanes, and a complex interchange design to maintain good levels-of-service. Such improvements would have extension impacts, and other locations along the existing Route 54 would still operate at poor levels-of-service. Conversely, an improved local road system would potentially remove significant amounts of traffic from Route 54 and allow a standard single point diamond interchange to function with acceptable levels-of-service.

4. Stripe Grand Glaize Bridge for three lanes of operation in each direction - The merge/diverges will operate at acceptable levels-of-service during the peaks under the design year volumes and with an additional merge/diverge lane for a total of three lanes in each direction.

Appendix 1 – Roadside Interview Results

OSAGE BEACH STUDY QUESTIONNAIRE STATISTICS						
Friday Evening Interviews			**Saturday Morning Interviews**			
Number of Responses = 220			Number of Responses = 216			
Origin	**Total**	**Percentage**	**Total**	**Percentage**	**Total(F&S)**	**Percentage**
St. Louis	11	5.0%	10	6.1%	21	4.8%
Camdenton	6	2.7%	9	4.2%	15	3.4%
Condos	28	12.7%	25	11.6%	53	12.2%
Eldon	7	3.2%	6	2.8%	13	3.0%
Home	55	25.0%	53	24.5%	108	24.8%
Work	11	5.0%			11	2.5%
Other	75	29.6%	95	44.0%	170	39.0%
Hotel	27	12.3%	18	8.3%	45	10.3%
	220		216		436	
Route Taken						
54 North	65	29.5%	62	28.7%	127	29.1%
54 South	87	39.6%	96	44.4%	183	42.0%
Rte 42	13	5.9%	16	7.4%	29	6.7%
Rte HH	4	1.8%	7	3.2%	11	2.5%
Rte KK	4	1.8%			4	0.9%
From North	10	4.6%			10	2.3%
From South	12	5.5%			12	2.8%
Other	11	5.0%	8	3.7%	19	4.4%
Bus 54	14	6.4%	27	12.5%	41	9.4%
	220		216		436	
Stops on the Way						
Yes	97	44.1%	89	41.2%	186	42.7%
No	123	55.9%	127	58.8%	250	57.3%
Purpose						
Shopping	88	72.7%	96	75.6%	184	42.2%
Recreation	11	9.1%	9	7.1%	20	4.6%
Other	22	22.0%	22	17.3%	44	10.1%
	121		127		248	
Time Adjustment						
Yes	52	23.6%	85	39.3%	137	31.4%
No	168	76.4%	129	59.7%	297	68.1%
					436	100.0%

Appendix 2 – Sample Postcard Survey

Your help is needed! The Missouri Department of Transportation is planning highway improvements for the Route 54 corridor. This short survey will provide important information on travel patterns of motorists currently utilizing this corridor to aid in the design and implementation of these improvements. Please answer the following questions about the trip you were making at the time you received this card and mail this card back within thirty-six hours of receiving it. NO POSTAGE IS REQUIRED. All surveys and comments are confidential. Please use this opportunity to help us address your individual needs.

1. What best describes where you were coming from at the time you received this postcard?
   - ☐ Kansas City
   - ☐ St. Louis
   - ☐ Columbia/Jefferson City
   - ☐ Local (in the Lake of Ozarks area) _____
   - ☐ Other Missouri Location _____
   - ☐ Out of State
2. Which route did you use to get here?
   - ☐ Route 54
   - ☐ Business 54
   - ☐ Business 54 via Community Bridge
   - ☐ Route 42
3. What best describes your primary destination at the time you received this postcard?
   - ☐ Wal-Mart or other adjacent uses
   - ☐ Outlet Mall or other adjacent uses
   - ☐ Between Grand Glaize Br. and Outlet Mall
   - ☐ Between Route KK and Grand Glaize Bridge
   - ☐ Route KK
   - ☐ South of Route KK
4. Please identify your destination by name, street, or landmark_____
5. How frequently do you travel Route 54 through Osage Beach?
   - ☐ Often, I live/work in the area
   - ☐ One or Two times a week
   - ☐ Primarily summer weekends and/or vacation
   - ☐ Less than three trips to the area a year
6. Will you make a return trip today? Yes ☐ No ☐
7. Is this a return trip from earlier today? Yes ☐ No ☐
8. Which of the following best describes the purpose of this trip?
   ☐ To hotel ☐ To work ☐ To shopping/restaurant ☐ To recreation ☐ To home
   ☐ To other _____
9. Did/will you make any stops in Osage Beach on the way to your primary destination?
   (i.e. gas, food, bank, etc.) Yes ☐ No ☐
10. Do you have any additional comments?_____

_____

Thank you for your valuable time and comments!

Appendix 3 – Roadside Interview Questionnaire

Surveyor:_____

Hour: _____

We are performing a study on behalf of the Missouri Department of Transportation.
Would you please answer a few short questions about your current vehicular trip?

	RESPONSES	I	II	III	IV
1	Where did your current vehicular trip to get to the Mall _____ begin?				
2	Which route did you take to get here? 54 N, 54 S, B54, 42 or Community Bridge)				
3	Did you make any other stops on the way?				
4	Will you make any other stops? If No to Question 3 or 4, go to question 7				
5	For what purpose were the other stops? **H**ome; **W**ork; **SC**hool; **SH**opping; **R**ecreation; **O**ther				
6	Please identify other stops by name, street or landmark				
7	Do you adjust the time or route for these trips based on congestion?				
8.	How frequently do you travel Route 54 through Osage Beach? 1. *Often, I live/work in the area* 2. *One or Two times a week* 3. *Primarily summer weekends and/or vacation* 4. Less than three trips to the area a year				

THANK YOU FOR YOUR COOPERATION! HAVE A NICE DAY.